[SEP]TEMBER, 1958

RUBBER WORLD

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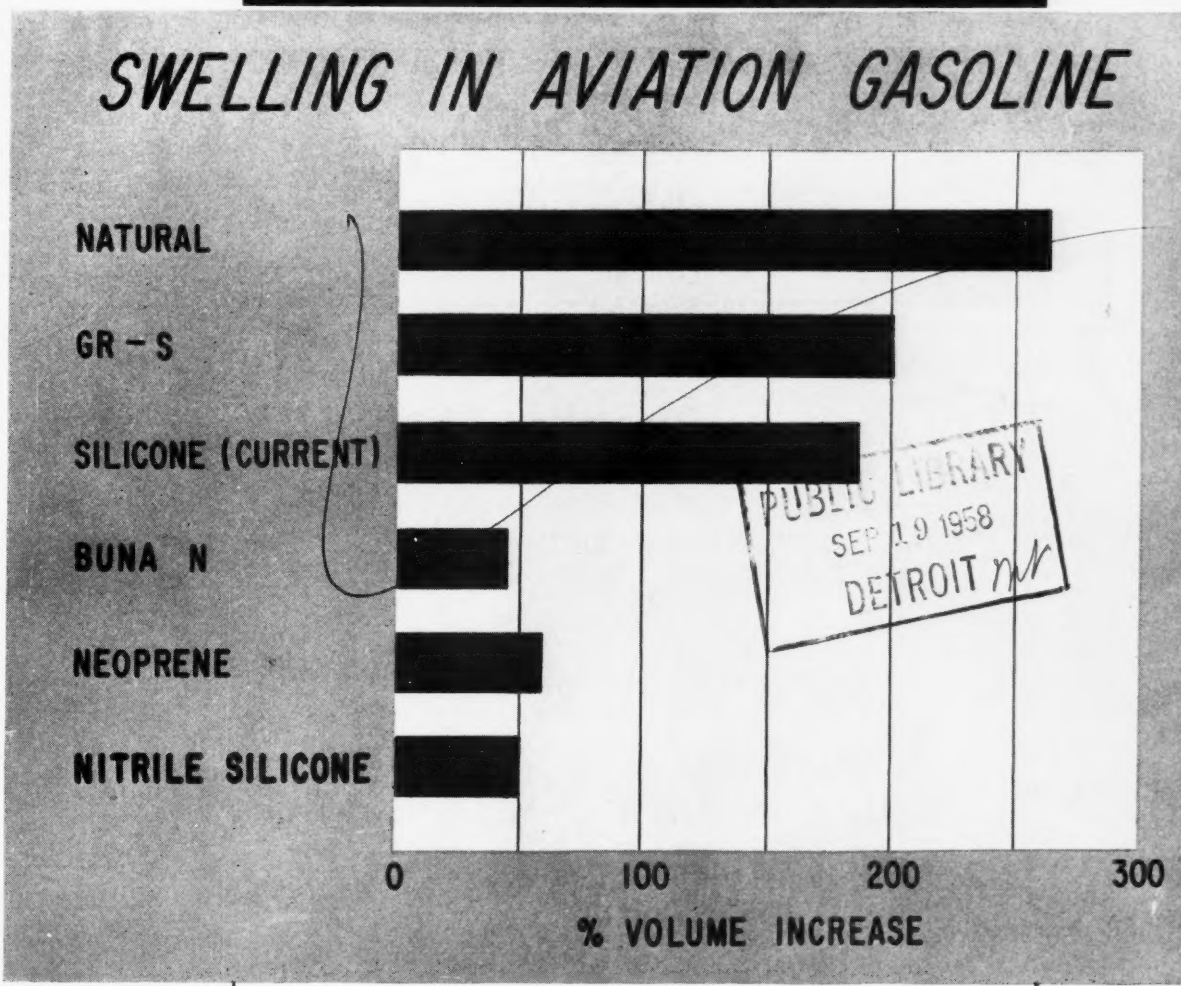
[Cont]ents, page 818



New Nitrile Silicone Rubber Announced (page 904)

CARBON BLACK DISPERSION AND VULCANIZATE PROPERTIES

By Sweitzer, Hess, Callan, page 869

[A] BILL BROTHERS
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. . . . and then to assist you by having every page in Rubber World give you maximum value.

This has been and will continue to be the fundamental publishing philosophy in the 69-years-young history of Rubber World, the Technical Magazine of the Rubber Industry. And to keep up with an industry that expands at a rate better than 200 million dollars a year and makes over 40,000 separate rubber products, we have introduced many modern publishing techniques and services to the magazine and the industry, which you, our readers, have probably noticed.

These include such things as: the largest *technical editorial* staff and background; front cover entirely editorial; easier-to-read contents page; technical article highlights; perforated editorial pages; constructive use of editorial color, art, and layout; and an active and representative Editorial Advisory Board.

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For instance, Rubber World research.

For years we have been using a variety of research techniques which help guide us to your current needs for new types of material, changes in emphasis on subject matter, as well as our presentation of it. Additionally, Rubber World enjoys the unique benefit of being a Bill Brothers Publication, which has magazines serving nine different fields—most of which have important segments of their markets made up of rubber manufacturers and applications. Our *Tires* magazine is, of course, a source of supplementary research and information, as are sister publications like *Sales Management* and its statistical "bibles" for all industry, the "Surveys of Buying Power."

In the months to come, many of you will have personal contact with out latest innovation—READER RESEARCH REPORTS—a reader research program designed to help suppliers to the rubber industry make their advertising in Rubber World more interesting and helpful to you. In this service highly trained field interviewers have been at work for the past several months contacting readers such as yourself. Our objective is to determine your current editorial needs and solicit your detailed comments and suggestions on both the advertising and editorial pages of Rubber World. This exclusive and *qualitative* type of research is being done on an extensive basis, but already the results insure that it is most worthwhile. Certain improvements have already been added, and from time to time we hope to give you informal reports summarizing your fellow readers' interests and needs.

May I restate our philosophy that "our job is to know you and your needs—and then serve you." Whether or not during the coming months the laws of chance select you for personal contact by the reader research interviewers, now and at all times we welcome the friendly counsel and suggestions of the important army of Rubber World readers.

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VOLUME 138, NUMBER 6 SEPTEMBER, 1958

CONTENTS

Cover Photo: Courtesy of General Electric Co.

The opinions expressed by our contributors do not necessarily reflect those of our editors

FEATURE DEPARTMENTS

Can you improve a GRS compound with one of these resins?

If you are interested in upgrading the properties of GRS compounded stocks, you may find one of these Durez phenolic resins useful.

They serve as effective plasticizers during processing, and also contribute materially to hardness, stiffness or boardiness, and abrasion resistance. These properties are of particular interest for such applications as shoe soles, top lifts, and tire beads.

Generally only 5 to 10 parts of resin per 100 parts of GRS will produce, with normal loading, Shore A hardness of 90 to 100.

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Compatibility • Phenolic resins do not have complete compatibility and reactivity with GRS as they do with nitrile-type rubbers. However, you can greatly increase compatibility by using some nitrile rubber in the formulation, serving as a common solvent or flux. This procedure greatly improves over-all physical properties of the vulcanized material.

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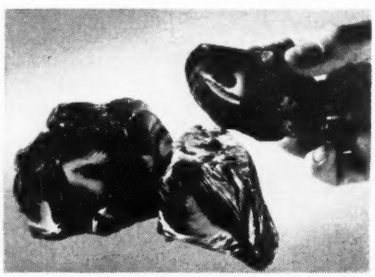
12687 powdered resin • This resin is used only in those instances where nitrile rubber is used as the common solvent or flux. It is more compatible with nitrile rubber than are the other resins recommended for use with GRS.

13355 powdered resin • This resin is most generally used with GRS. It is lighter in color than 12687 and more effective, when used without nitrile rubber, in increasing hardness and stiffness. It is suitable for so-called "light oak" shoe soling.



13349 lump resin • This is the base resin used in producing 13355. In this form, it is entirely thermoplastic and is safe for use where high processing temperatures are encountered, as in Banbury mixing. It requires addition of 8% hexamethylenetetramine to make it properly thermosetting and give properties equivalent to 13355. The hexa is added either at the last stage of Banbury or on the warm-up mill.

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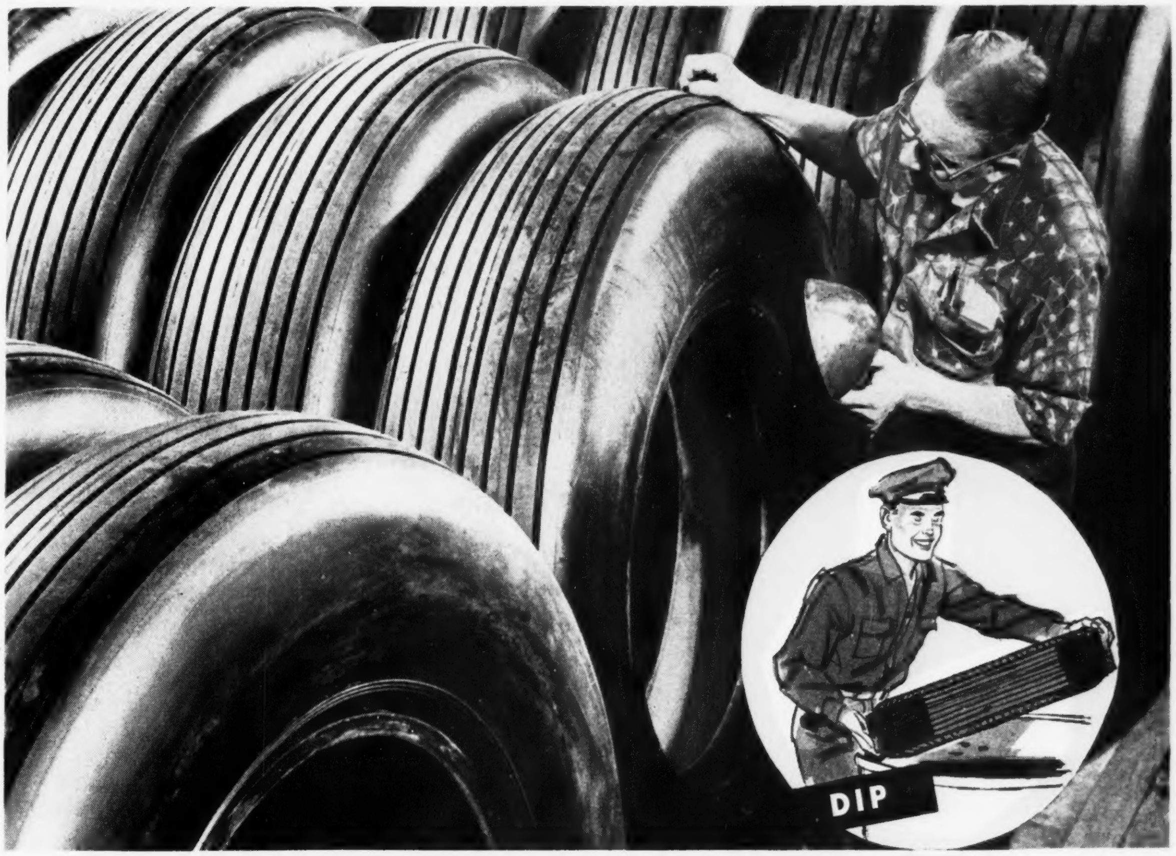
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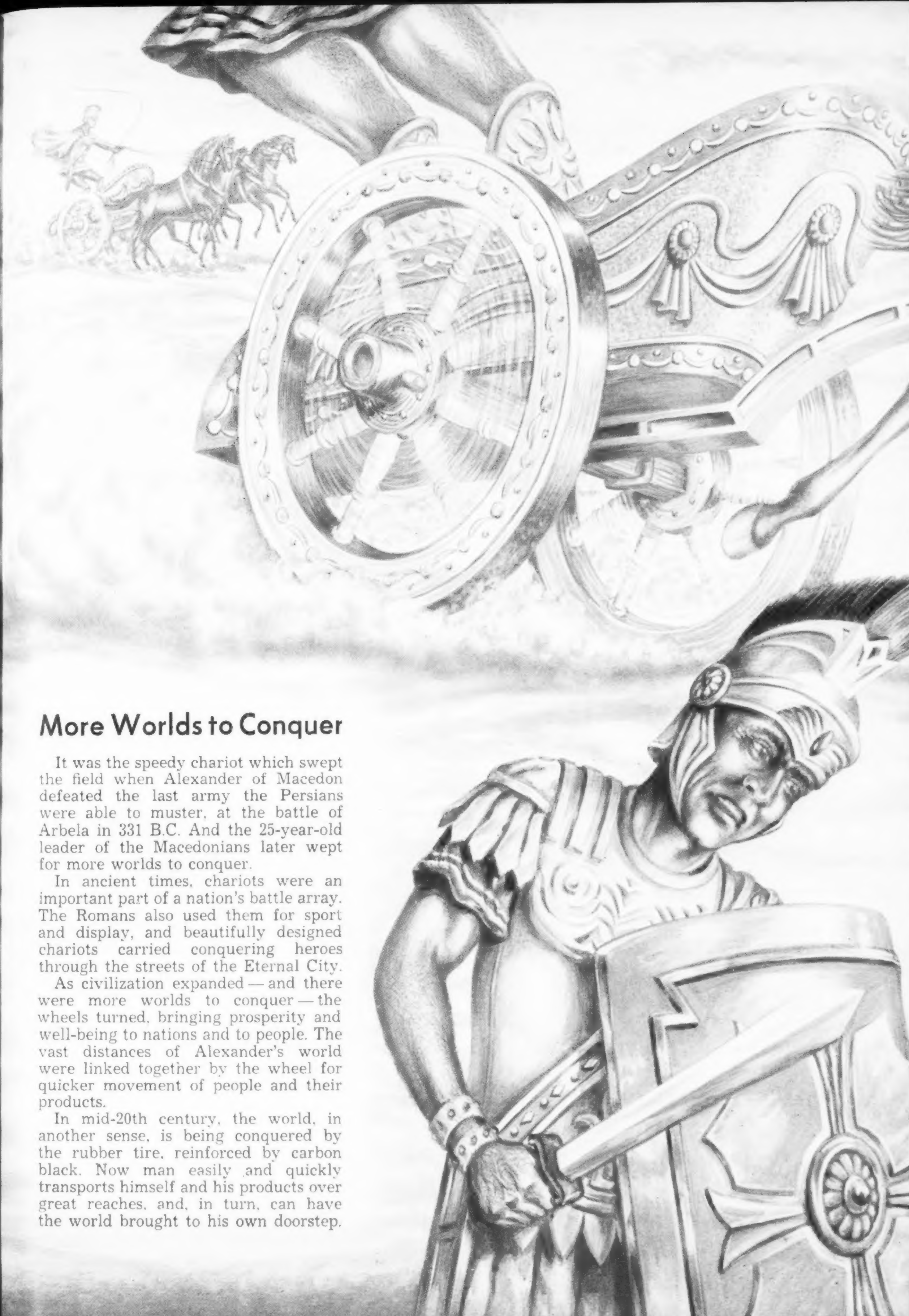

More Worlds to Conquer

It was the speedy chariot which swept the field when Alexander of Macedon defeated the last army the Persians were able to muster, at the battle of Arbela in 331 B.C. And the 25-year-old leader of the Macedonians later wept for more worlds to conquer.

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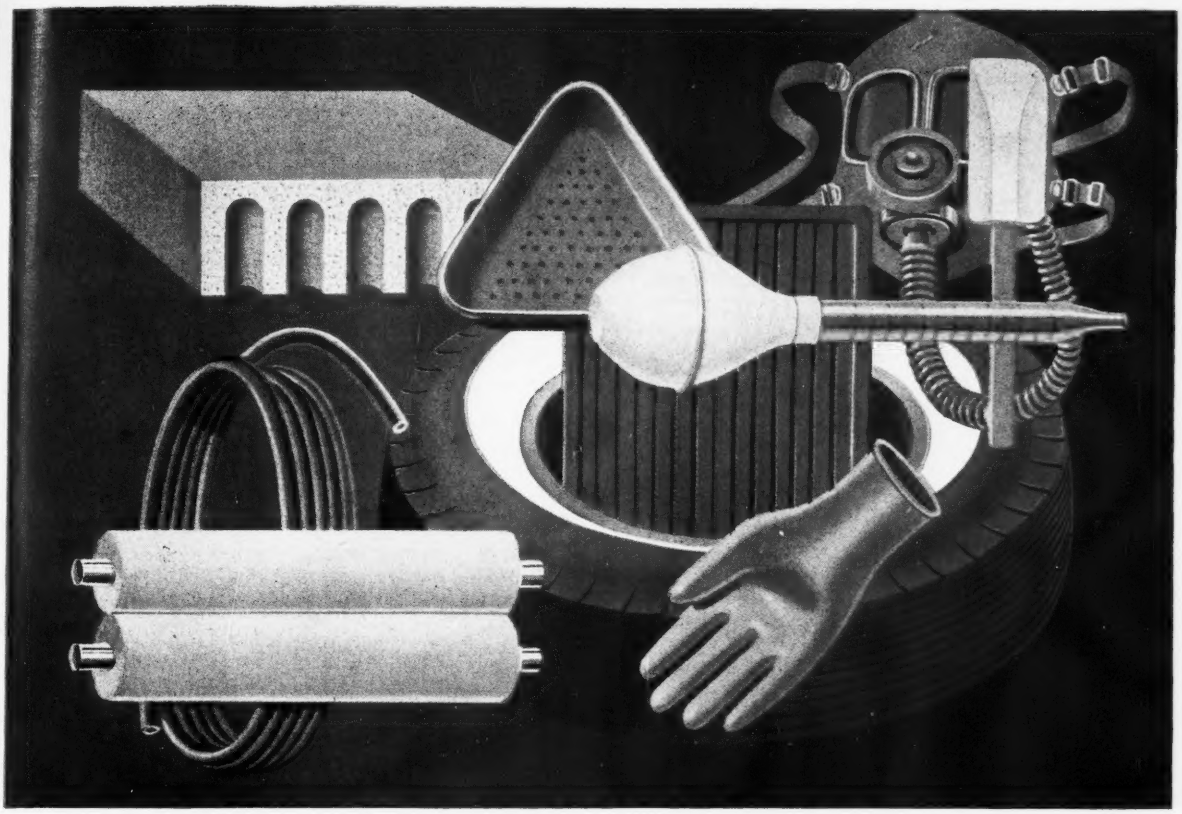

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INSPECTION DEPT. CALLED. THEY SAID THEY HAVE A BUNCH OF HEELS...
THEY SAID IT. I DIDN'T.
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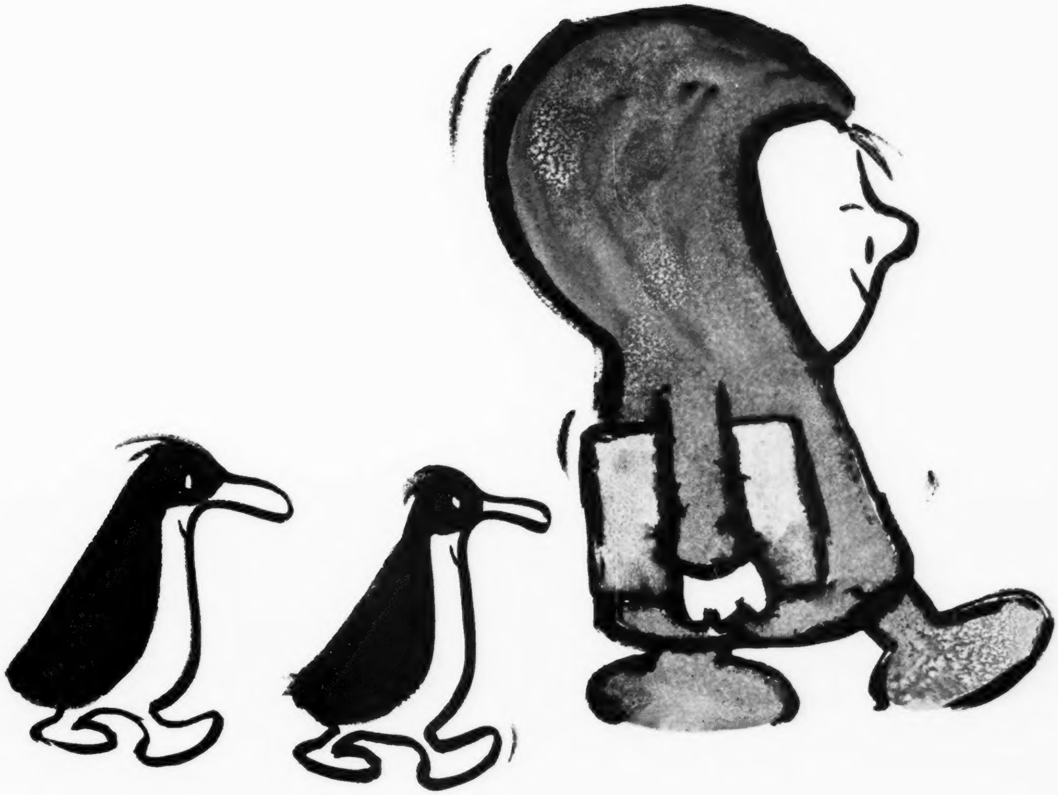
QUALITY CONTROL MGR.
1
...THAT THEY HAD TO REJECT. THE HEELS LOOK MORE LIKE FOOT-PADS.
FOOTPADS! GADZOOKS, WE NEED A FLATFOOT!
2
YOU NEED A GUMSLINGER. GOO IS ROBBING YOU.
AGENT 36
WHERE DID YOU COME FROM?
3
THE PROBLEM IS URGENT, AGENT!
I HEARD YOU ON MY TWO-WAY WRIST RADIO, AND ANKLED RIGHT OVER HERE.
AGENT 36
4


PRODUCTION IS FLIPPING, BUT WE CAN'T PASS SHODDY WORK!
YOUR TROUBLE COMES FROM MONSTER Mc GOO. BUT DON'T BE A CREPE-HANGER. DOW CORNING SILICONES WILL GET RID OF HIM.
PARTING IS SUCH SORROW
LES MESS INSP.
AGENT 36
GO GAGE
GO-GO GAGE
REJECT
5
YOUR MOLDS ARE SICK, SICK, SICK. WE'LL HEAL THEM (SIC) WITH SILICONES. BE GONE, Mc GOO!
AGENT 36
6
YOU'RE THE VANGUARD XXXVI.
SILICONES KEEP GOO FROM FORMING, REDUCE SCRAP, GIVE BETTER SURFACE DETAIL, SPEED PRODUCTION, CUT MOLD MAINTENANCE.
AGENT 36
7
YOU'RE REALLY IN ORBIT.
ALWAYS WITH DOW CORNING SILICONES. THEY NEVER LET YOU DOWN.
THAT SURE SPEEDS THE PARTING, GUEST!
AGENT 36
8
YOU CAN'T FIND A BETTER RELEASE AGENT THAN 36 EMULSION. GET YOUR FACTS. DOW CORNING'S THE SOURCE. DO IT NOW!



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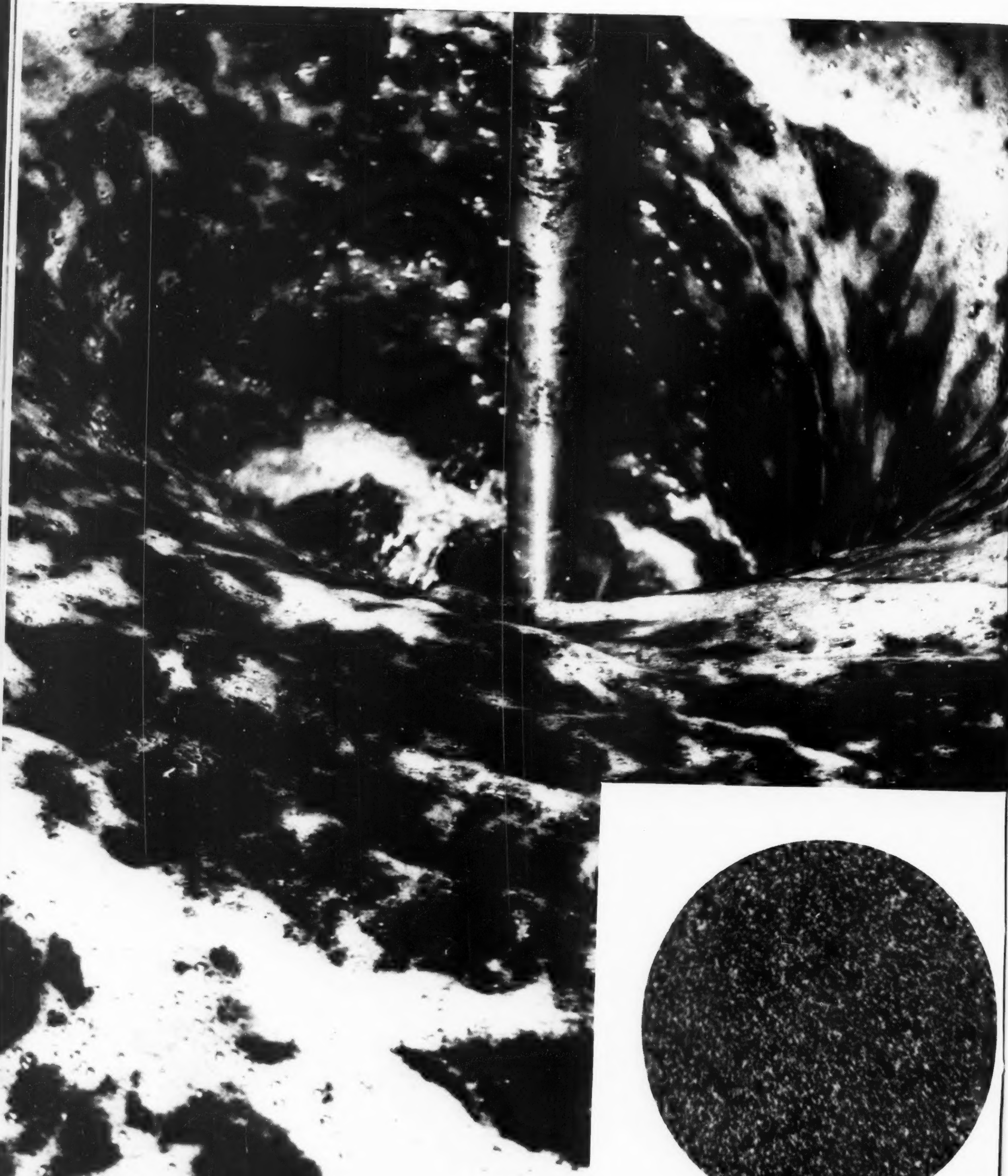

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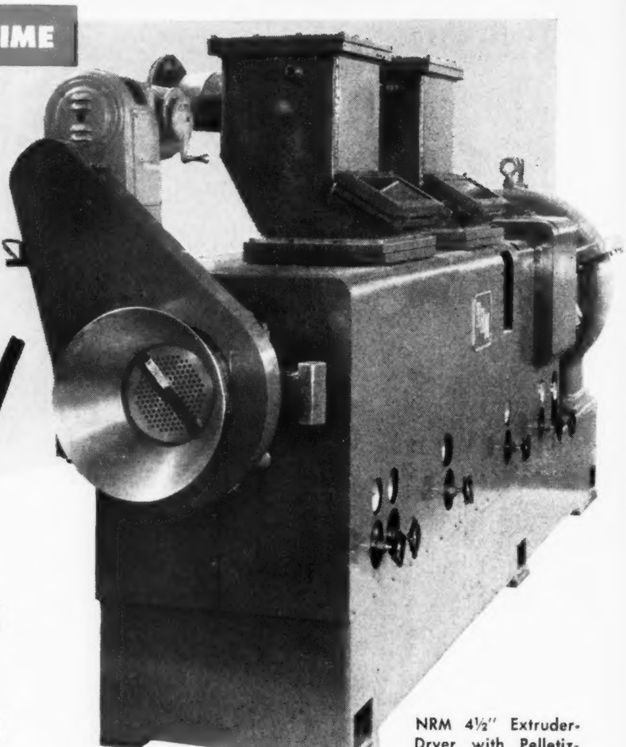

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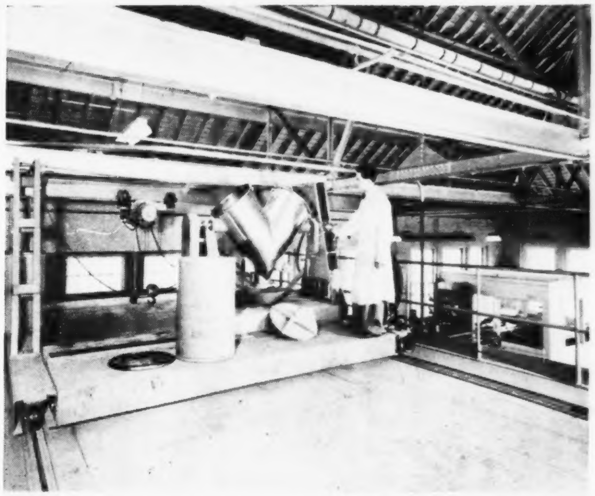

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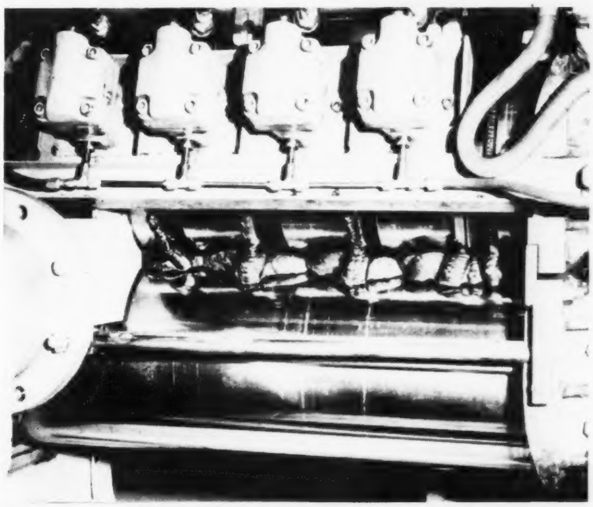

The Continuous Automatic Mill dispenses pigments and plasticizes uniformly without manual attention.

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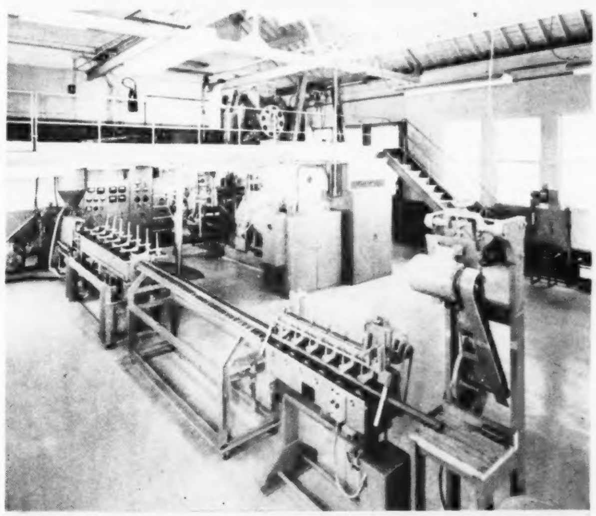

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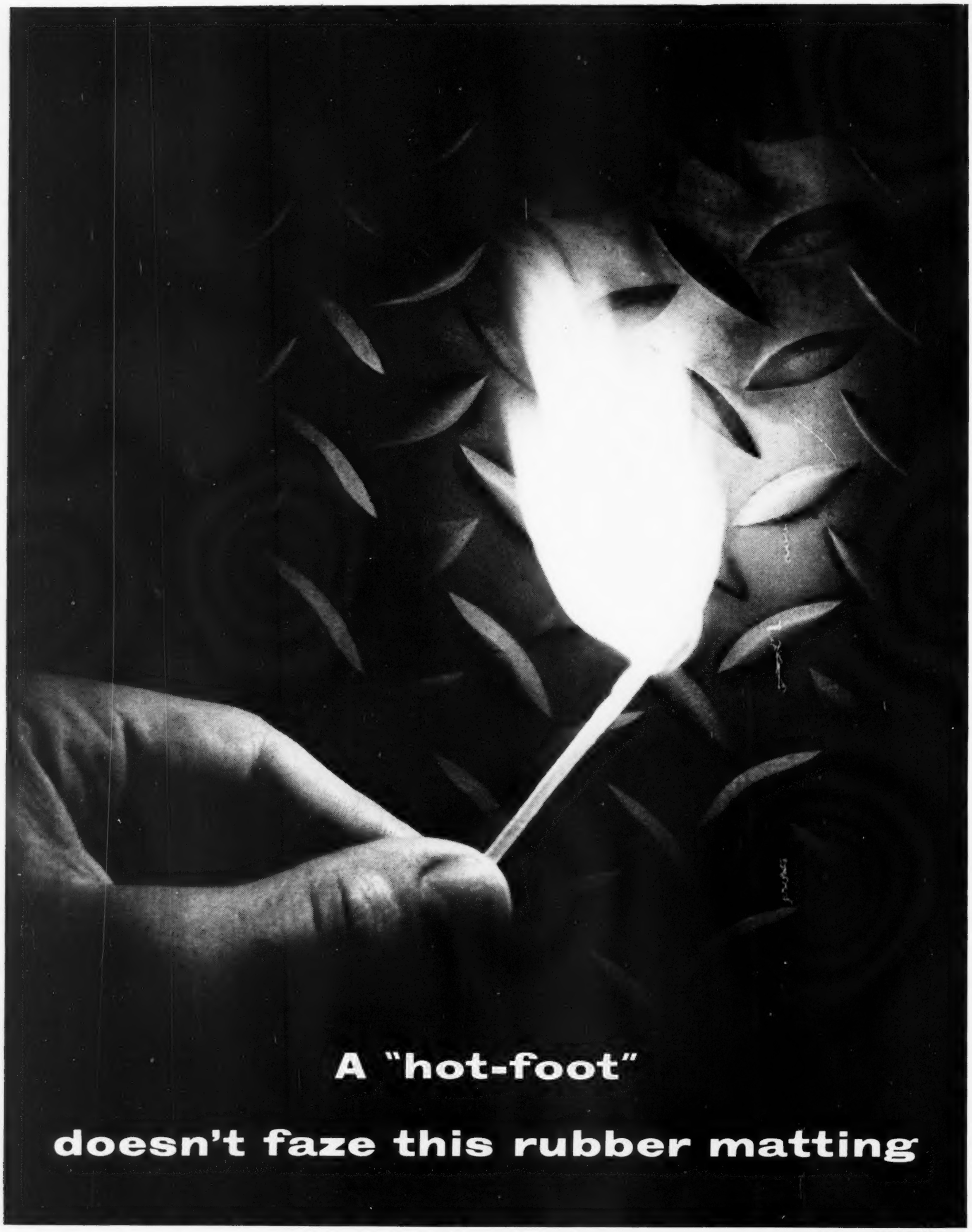

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RUBBER WORLD
EDITORIAL

Concern About SBR Prices, Supplying Small Business, Unrealistic

THE "Third Report of the Attorney General on Competition in the Synthetic Rubber Industry," which was released early in August, records many facts already well known to the industry. Its emphasis, however, on the "almost complete lack of price competition" in the SBR industry, and on the possible inability of small business to obtain the SBR it will need in periods of short supply, seems unrealistic.

In discussing the lack of SBR price competition, the Report makes the point that "there seems little excuse for continuing price uniformity, born of Government ownership," into a period marked by a buyers' market and in the face of the recent decline in the price of natural rubber.

Two reasons for the "continuing price uniformity" for most SBR grades are found in the Report's own phrase "born of Government ownership" and in the fact that SBR producers operated during 1957 at rates below plant capacity and with higher commercial expense and increasing unit production costs. When the SBR plants were sold to private industry in 1955, it was necessary that the private producers continue to market many of the more or less standardized grades developed under the government program, or chaos would have immediately developed in the consuming industry. Any reduction in prices during 1957 would have put most producers in the red, and it was the competition between the producers and with natural rubber in a buyers' market that has prevented a rise in SBR prices.

In the synthetic rubber industry you can't have prices higher than your competitors for comparable grades and still retain your share of the market for very long. Most of the SBR grades continued from the government program will have to be marketed for some time to come because of consumer demand. They will have to be sold therefore at about the same price by the several producers making these grades until such time as there is a "breakthrough" by one or more producers in manufacturing technology or material prices. It will be in the areas of technical service and possibly freight allowances where the intensity of competition will continue to grow since they are of as much or even greater economic significance to the consumer as a price change would be.

As improvements are made in existing grades and as really new grades are developed, price differences will develop. Here again, however, as soon as one or more producers match a given new grade, the price for that grade among the several producers will be about the same, as a result of competition rather than the lack of it.

It is difficult also to share the alarm expressed in this Third Report regarding the inability of small business consumers to obtain the desired amount of SBR in periods of short supply because there is no workable definition of "small business" in the Disposal Act. A workable definition is required, but the productive capacity for synthetic rubber in this country is so much in excess of the estimated domestic and export demand for the next five to ten years that no periods of short supply can be easily foreseen in that period.

R. G. Seaman
EDITOR

RUBBER WORLD

The Dispersion of Carbon Black in Rubber And Its Role in Vulcanizate Properties—I[1]

By C. W. SWEITZER, W. M. HESS, and J. E. CALLAN
Columbian Carbon Co., New York, N. Y.

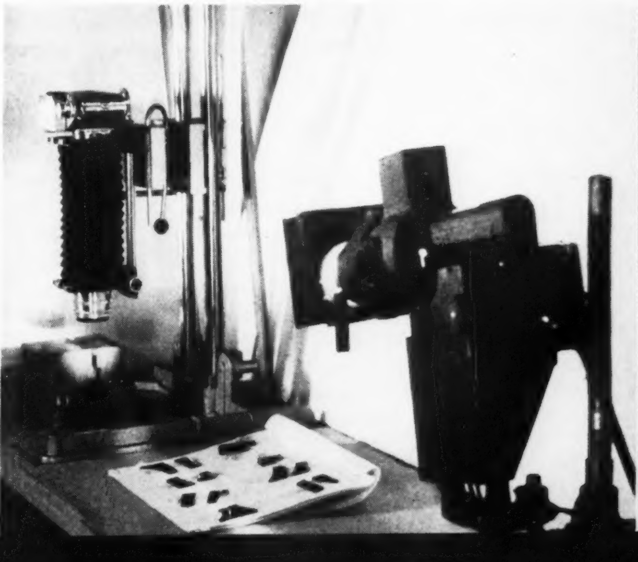
THE dispersion of carbon black has long been recognized as one of the most important factors in the development of good physical properties in black rubber compounds. When casual examination of black stocks showed the carbon black to be poorly dispersed, the physical properties of the vulcanizate were found to be depressed. On the other hand, when the dispersion of the carbon black was observed to be good, the physical properties of the vulcanizate were usually found to be enhanced. As an example, poor dispersions of carbon black in styrene-butadiene rubber (SBR) tread stocks have been shown to depress tire wear by more than 25%. With this ever-present possibility of drastic consequences resulting from improper mixing of carbon black-rubber compounds, or conversely of advantages resulting from proper mixing, it is understandable why much study has been devoted to this problem during the past three decades.

For the evaluation of the state of carbon black dispersion in rubber compounds a variety of methods has been employed. The obvious method of examination of torn surfaces by eye or hand lens, described by Wiegand in 1926 (1)[2] and later by others (2, 3), is still popular with many compounders for determining readily gross differences in the state of dispersion. The majority of investigators sought more than just gross differences in dispersion, however, by employing various microscopic methods. Green (4) and others (5, 6) presented the first reports on the examination of microsections of stock by the light microscope.

With the subsequent introduction of the electron microscope a variety of new methods for preparing suitable thin sections or films of rubber compounds was developed. Ladd (7) described several methods including initially the rub-out, the Formvar replica, and the pimple-mold curing techniques, followed later (8) by high-speed microtoming. More recently (9) improved microtoming methods have been described involving freezing of the specimen in a chamber attached to the microtome. Worthy of mention, too, is the use of dilute solutions of rubber stocks for microscope examination (10-12), as well as the autoradiography method (13).

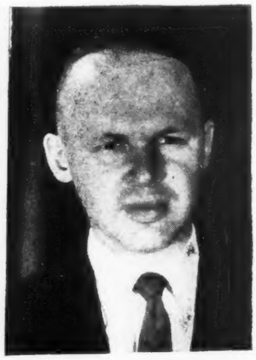
All of these methods were in some respects unsatisfactory; the principal objections were either the lack of quantitative data or the distortion of the

Fig. 1. The apparatus for photographing the torn surfaces of rubber stocks in order to determine the degree of carbon black dispersion



[1] Presented before the Division of Rubber Chemistry, Chemical Institute of Canada, Toronto, Ont., May 28, 1958.
[2] Numbers in parentheses refer to Bibliography items at end of this installment.

J. E. Callan



W. M. Hess

C. W. Sweitzer

The Authors

C. W. Sweitzer, director of research and development, Columbian Carbon Co., received his bachelor's, master's and doctor's degrees all from the University of Toronto, the last in 1927.

Dr. Sweitzer was a senior research fellow at the Mellon Institute of Industrial Research from 1927 until 1938. He joined Columbian Carbon in 1938 as chief chemist, became research director in 1951, and was promoted to his present position in 1955.

He is a member of the American Chemical Society and its Division of Rubber Chemistry, the Electrochemical Society, the Chemists Club of New York, and the Alumni Association of the University of Toronto.

W. M. Hess, chief physicist at Columbian's research laboratories, received his B.S. from Long Island University in 1950. He joined Columbian Carbon Co. the same year.

Mr. Hess worked on new microradiography techniques until 1954. He took charge of the electron microscope laboratory in 1955.

He is a member of the Electron Microscope Society of America and the American Electro-Platers Society. He is a co-author with W. A. Ladd and M. W. Ladd of the book, "High Resolution Microradiography," published in 1956.

J. E. Callan, assistant manager of the rubber laboratory, received his B.S. from Cooper Union in 1953.

Mr. Callan has been employed at the Columbian research laboratories since 1942. He was appointed to this present position in the year 1953.

He is a member of the American Chemical Society and its Rubber Division and the New York Rubber Group.

original dispersion state by the sampling method or the doubtful value of the microsections as valid samples of the stock. In an effort to overcome these objections Leigh-Dugmore (14) counted the carbon black agglomerate particles in microtomed sections with the light microscope and correlated these counts to vulcanizate properties.

Employing one or more of these various methods for eva'uating the state of dispersion, numerous investigators (11, 13, 15, 16) were able to correlate the state of dispersion with physical properties of the compounds. The degree of dispersion in these studies was usually altered by varying the mixing procedure, although Dannenberg (17) obtained different states of dispersion by using carbon blacks of varying density.

Improvements in the state of dispersion have resulted from drastic changes in the conventional mixing technique; the most revolutionary probably was the premixing of carbon black and rubber in the latex phase or as originally designated, "Latex Compounding" (18). The most significant property improvements based on this approach have resulted from the recent continuous Columbian Black Rubber process reported by Braendle (19).

Another important deviation from the conventional mixing technique, which will develop improved vulcanizate properties with some polymers, is the use of high-temperature mixing during the masterbatch stage either with normal or higher loadings of carbon black. These improvements are ascribed to the development of an enhanced carbon gel complex (20, 21), with a consequent rearrangement, if not an improvement of the dispersion pattern.

These various studies have contributed greatly to our understanding of the carbon black dispersion problem in rubber, with the need evident, however, of a more practical and a somewhat broader approach to the whole dispersion subject. This is essentially the purpose

Dispersion of Carbon Black in Rubber; Its Role in Vulcanizate Properties

The importance of adequate dispersion of carbon black in rubber compounds has long been recognized as one of the most important factors in the development of good physical properties in the vulcanizate. The whole subject of black dispersion in rubber has been studied in this paper in a broad as well as a practical manner in connection with (1) the evaluation of the state of dispersion, (2) factors controlling dispersion, and (3) correlation of dispersion to vulcanizate properties.

In evaluating the state of dispersion it is important that means be employed to follow this state of dispersion from the undispersed aggregates to the colloidally dispersed material or to look at "dispersion in depth." Four methods of dispersion evaluation, which used magnifications from 40 to 25,000 were employed in this work.

The photographic method is particularly adaptable to SBR tread stocks and is considered adequate to predict with some degree of certainty the probable performance characteristics of tread compounds.

The light microscope method is recommended for a preliminary evaluation of the state of dispersion for carbons coarser than fully reinforcing blacks, as well as for polymers other than SBR. The X-ray method is especially recommended for the study of unvulcanized stocks and non-carbon compounds.

In all instances, for complete evaluation of the state of dispersion, the lower magnification methods should be supported by examination of the sample by an electron microscope.

Dispersion controlling factors investigated included the type of polymer, grade, and loading of carbon black, a variety of dry mixing procedures, and wet masterbatching.

Improved black dispersion and vulcanizate physical properties with fine reinforcing blacks in SBR are obtained by the use of high carbon black content masterbatches, by adding processing oil as a final step, by avoiding excessive mixing temperatures, and by proper and intimate either wet or dry premixing of the black and the rubber.

The milling essentials for adequate dispersion of carbon black in rubber are, therefore, high viscosity in the masterbatch mix without initially high temperature, plus as much premixing of carbon black and rubber as possible before milling to insure maximum carbon-rubber bonding and minimum rubber degradation.

of the present paper. For convenience in treatment the subject is divided into three rather logical divisions:

(1) The evaluation of the state of dispersion;

(2) The study of factors controlling dispersion;

(3) The correlation of dispersion to vulcanizate properties.

Four methods employed in our laboratories for following the state of dispersion are reviewed, with particular emphasis on a practical photographic technique for rating gross dispersion differences. Preliminary studies on the influence of several important factors on the state of dispersion are described. Finally, correlations of dispersion state to vulcanizate properties are developed from a series of investigations with typical tread compounds.

State of Dispersion Evaluation

Carbon black, as received by the rubber compounder, consists of aggregates or clusters of colloidally fine particles which in the normal mixing process must be broken down or dispersed, insofar as possible, to a state of uniform and particulate distribution within the rubber matrix. In most instances this ultimate goal is never reached, with the final state of dispersion inhomogeneous with respect to distribution as well as the degree of disaggregation or dispersion of the carbon black. In evaluating the state of dispersion it is important that means be employed to follow this state of dispersion from the undispersed aggregates to the colloidally dispersed material, or, in other words, to look at "Dispersion in Depth." With this requirement in mind four methods for evaluation were employed in these investigations.

Dispersion Evaluation Methods

The Photographic Method. The photographic method, developed to provide an easy and practical means for evaluating gross dispersion differences in vulcanized stocks, involves essentially the application of photography to the old method of hand lens examination. Stress-strain slabs, or thin sections of any vulcanized compound, are torn to provide as smooth a surface as possible. The sections are mounted in a vise with the freshly torn edges alined in the same plane as the jaws of the vise, as shown in Figure 1.

Since the stocks are black, an intense arc light is used for illumination with the light set to strike the rubber surface obliquely to accentuate any raised imperfections. The use of a polarizing filter will eliminate

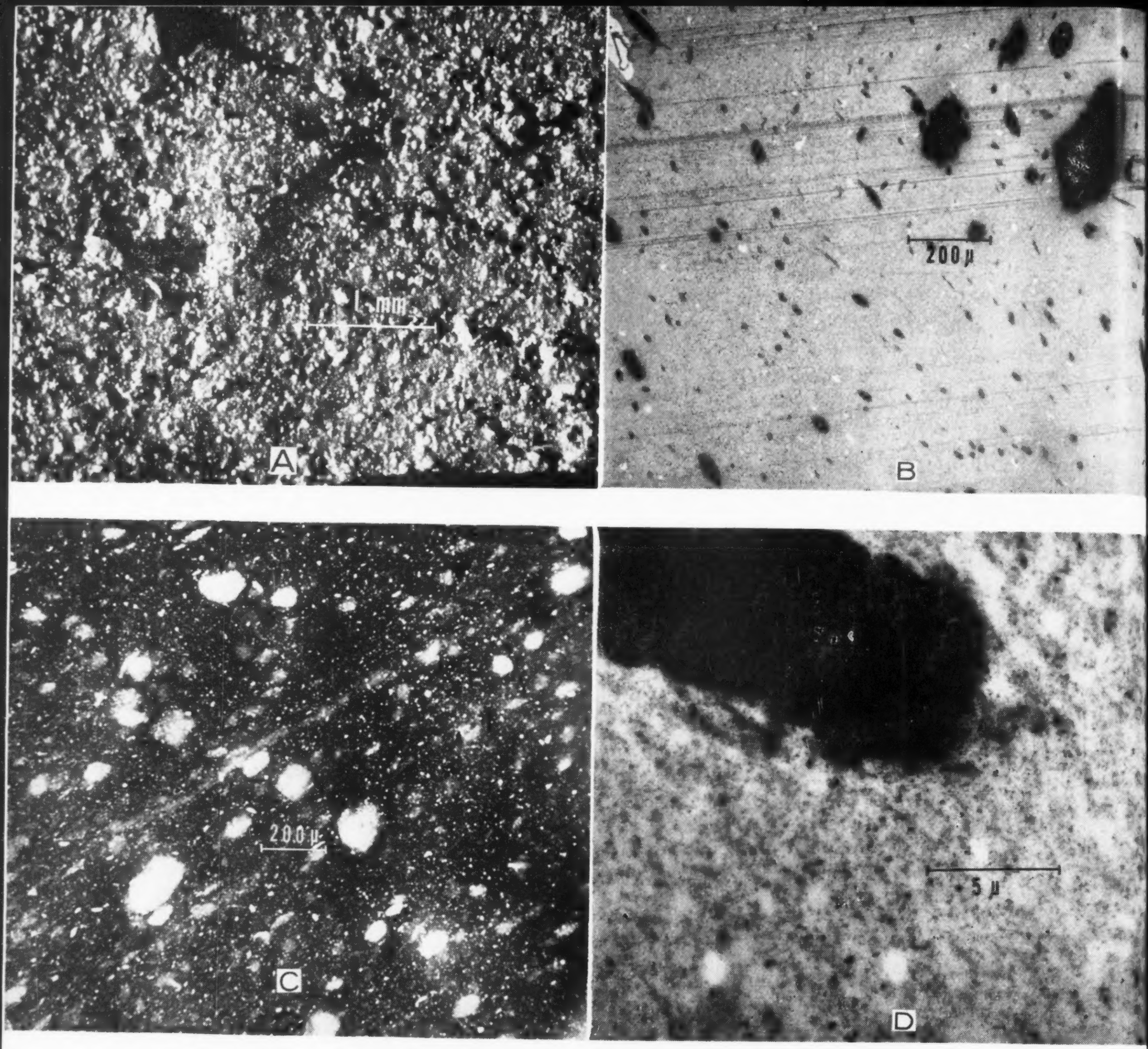
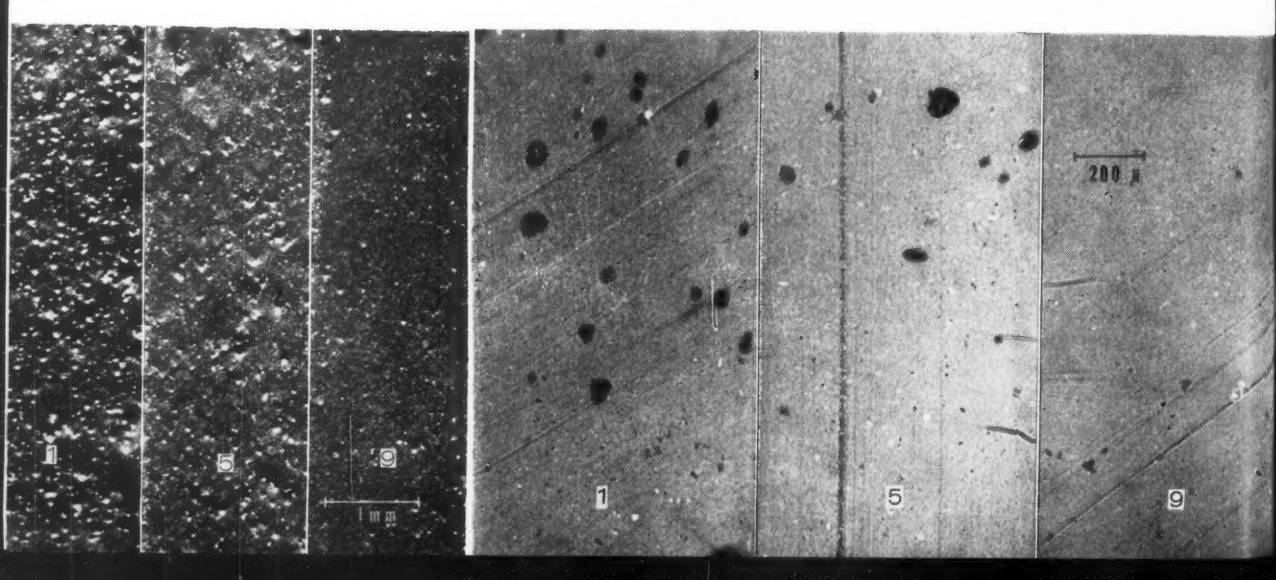


Fig. 2. Illustrations of poor dispersion (0 rating) of 50 p hr. ISAF black in SBR, by four different methods of evaluation: A, photographic method; B, light microscope m ethod; C, X-ray method; D, electron microscope method

Fig. 3. Carbon black dispersion standards 1, 5, and 9; *l eft*, by photographic method; *right*, by light microscope method



to a great extent any glare problems that might interfere with good photography.

The photographing is carried out with an Exakta VX[3] camera with multiscope bellows and a 50-mm. focal length lens, mounted on a rigid stand with flexibility for change of camera position such as an Exakta Copymat, and set directly above the specimen. A fairly typical exposure with Kodak[4] Panatomic X film (exposure index-25) is six seconds at f/16.

The magnification at which the photographs are taken and that at which they are printed are a matter of preference. Good-quality prints at a magnification of 40 diameters can be obtained readily from negatives taken at about three diameters. In this study we standardized on the 40x prints. The photographed torn surface of an SBR tread compound with a poor dispersion of carbon black is shown in Figure 2.

There are definite advantages in this photographic method. It is a fast test and easy to carry out. It provides permanent records in the form of prints, which can be studied at leisure and used for the comparative rating of a sequence of compounds. It is particularly applicable to low-temperature SBR tread compounds in which carbon black agglomerates are most likely to persist.

Disadvantages lie in the inability to trace the state of dispersion below the agglomerate level. This method, moreover, is not particularly well-adapted to the examination of uncured stocks.

THE LIGHT MICROSCOPE METHOD. This method is basically the same as that described by earlier investigators, involving the examination of microtomed sections of stock by transmitted light under the light microscope. Slices of rubber compounds about two microns in thickness are cut on a microtome. The rubber is first hardened either by freezing or embedding in methacrylate to permit satisfactory sectioning by the microtome.

In the present study the methacrylate method for preparing specimens was employed. This operation is somewhat easier to carry out than the freezing method; besides it permits the preparation and the storage of a large supply of samples. In the methacrylate method the initial step is to suspend small pieces of the rubber specimens in gelatin capsules containing butyl (or a mixture of butyl and methyl) methacrylate monomers and the proper amount of catalyst. Polymerization is allowed to take place overnight during which time the methacrylate penetrates the rubber, causing some swelling. The amount of swell will sometimes vary, but with care can be kept fairly constant. With a 50% swell enough methacrylate penetrates to provide sufficient hardness for sectioning.

A microtomed section of the same stock photographed in Figure 2A was examined by the light microscope method with the result presented in Figure 2B. The undispersed agglomerates of carbon black, which correspond to surface imperfections in Figure 2A, are clearly indicated. Confirmation of the interpretation given the photographic results is one of the principal advantages of the light microscope method.

THE X-RAY METHOD (CONTACT MICRORADIOGRAPHY). Microtomed sections are also essential for this method, but owing to the great penetrating power of X-rays thicker sections can be used. Sections of vulcanized stocks of about 40-micron thickness were usually employed in these investigations although the thickness was varied on occasion to secure maximum contrast with different states of dispersion. Sections of unvulcanized stock, ranging from 10 to 40 microns in thickness, provide suitable samples for examination.

Contact microradiography requires that the object under study be placed in close contact with the recording film to eliminate the possibility of geometrical blurring. An X-ray beam from a fine focal spot is then passed through the specimen for the required time, which is a function of both the thickness and the density of the specimen. An image will be formed on the film when differences in X-ray absorption occur.

Carbon black, for example, is about twice as dense as rubber and will therefore stop more X-rays if a beam of suitably long wave length is employed. An undispersed carbon agglomerate will show up on the contact negative as a white spot. Unmixed curatives also show up as white spots, but are sharper and more contrasting owing to their greater density. Linear outlines are also more apparent for curing agents and other non-carbonaceous material.

The instrument employed for this microradiography work was a Philips Electronics CMR[5] unit. Perhaps the outstanding feature of this unit is the tube, capable of producing a beam of extremely soft X-rays in the range of 1-5 kilovolts (k.v.). With most instruments X-rays of this wave length cannot pass through the tube window. The window on the tube of the CMR unit is a 50-micron-thick sheet of beryllium and is capable of transmitting X-rays with a wave length as long as 6-8 Å. Resolution is limited by the grain size of the photographic emulsion employed as a recording medium. Kodak Spectroscopic Film, Type 649-0 was used, with resolution below 0.5-micron possible in contrasting objects.

Because the density of carbon black does not vary too greatly from that of rubber, contrast is critical. Three factors greatly influence contrast: film type, specimen thickness, and the wave length of the X-ray source. An X-ray beam of 3.5 k.v. was used for most of these studies, which allows for exposures of about five minutes with 40-micron-thick specimens of rubber. The technique is a highly workable one at this setting and can be employed in a completely routine fashion. Voltages less than 3.0 k.v. necessitate much longer exposures, and the specimen chamber must be evacuated because of air absorption of the X-rays.

A microtomed section of the stock photographed in Figure 2A was examined by the X-ray method, with the result given in Figure 2C. Confirmation of the interpretation given the photographic results is again indicated. This method has several distinct advantages over the light microscope method, including better sampling due to thicker specimens, applicability to un-

[3] Exakta Camera Co., Bronxville, N. Y.
[4] Eastman Kodak Co., Rochester, N. Y.
[5] Philips Electronics, Inc., Mt. Vernon, N. Y.

cured stocks, again due to use of thicker sections, and resolution of non-carbon ingredients in the compound. It is not, however, so good as the light microscope method in resolving very small carbon agglomerates within the field.

Electron Microscope Method. The electron microscope method requires rubber sections cut to a thickness of about 0.05- to 0.10-micron, prepared by the same basic technique employed for the light microscope method. The advantages of electron microscopy are the resolution of the ultimate carbon black aggregates and particles, the determination of particle size and shape, and the general state of homogeneity for the dispersion. The disadvantages are very poor sampling, particularly when aggregative as well as ultimate particles are involved, and the greater time and care required in the method.

An electron photomicrograph of the same stock examined in Figure 2A is presented in Figure 2D. Resolution of the ultimate carbon particles within the large aggregate is shown as well as a high degree of dispersion for the remaining carbon black. This type of distribution is quite common, well dispersed carbon black together with aggregates of varying size of undispersed carbon black.

Evaluation of Dispersion in Depth

The four methods described provide the means for a complete evaluation of the state of dispersion for all carbon blacks in any polymer. The photographic approach is a quick and reliable method for screening the overall dispersion pattern in a rubber compound. If the pattern is relatively free of aggregates, then evaluation proceeds by the other techniques of higher resolution. If on the other hand, the pattern is one of appreciable aggregate material, in varying size and number, such as is common, for example, in low-temperature polymer (LTP) SBR tread stocks, then evaluation by the photographic method alone is generally adequate for predicting probable performance characteristics of the stock.

The light microscope and X-ray approaches, employing higher magnification, permit a more accurate evaluation of the finer aggregate material and provide confirmation for the interpretation of the results from the photographic approach. The X-ray method can also be used with unvulcanized stocks and for the evaluation of non-carbon components in the compound. When these methods fail to resolve differences in the state of dispersion, resort to the electron microscope will provide the ultimate answer.

The use of these four methods for following the state of dispersion, from the appearance of a torn surface to the disposition of the ultimate carbon particles, has been demonstrated in Figures 2A, 2B, 2C, and 2D for a selected poor dispersion. Space does not permit inclusion of similar studies on normal or good dispersions. In most instances however, the major difference between two dissimilar dispersions is likely to be in the size and the number of the agglomerate particles, with the dispersion of the ultimate particles (the background) identical for both stocks.

The importance of following dispersion from aggregate to ultimate particles through a series of magnification steps, in order to develop a true picture of the final state of dispersion in any carbon black-rubber compound, is recognized. This procedure is designated "Dispersion in Depth."

Dispersion Standards by Photographic Method

For those carbon black-rubber stocks where the presence of agglomerates of varying size and number is the rule, such, as for example, with the full reinforcing carbon blacks in SBR tread compounds, the photographic method provides a simple and useful means for rating dispersion and predicting probable performance of the stocks. From a large number of photographs of SBR tread stocks in which the dispersion varied widely, and for which compound properties were available, a series of dispersion standards was selected ranging from a poor dispersion (rating 1) to a nearly perfect dispersion (rating 9). These standards were selected on the basis of the number and the size of agglomerates shown on the photographic prints, with the number and size decreasing by quantitatively measured steps in going from the 1 to the 9 dispersion rating. Ratings of 0 and 10 are not normally found in either laboratory or factory stocks.

Figure 3 (*left*) presents dispersion standards 1, 5, and 9. That these photographs do actually indicate carbon black aggregates is confirmed by the light microscope picture of the same 1-5-9 standards in Figure 3 (*right*). The correlation of these levels of dispersion to the properties of SBR tread compounds will be discussed later.

Factors Controlling Dispersion

A large number of factors influences the degree of carbon black dispersion in rubber compounds, far too many, in fact, to be reviewed in the present paper. Several of the more important factors discussed here were investigated solely for effects on dispersion, with particular emphasis on the grade of carbon black and the type of polymer; in the next section of the paper other factors are discussed in terms of dispersion as well as vulcanizate property effects.

Particle Size of Carbon Black

It has long been recognized that the finer carbon blacks are more difficult to disperse than the coarser blacks; this greater difficulty is due to the higher cohesive forces binding these finer particles within the agglomerates as well as the increased surface requiring wetting by the polymer. This difference in dispersion behavior, under identical mixing conditions, between coarse and fine carbon blacks, is demonstrated in Figures 4A, 4B, 4C and 4D, inclusive. The coarse black is Furnex,[6] a semi-reinforcing furnace black (SRF) with an average particle diameter in the range of 80 $m\mu$;[7] the fine black is Statex[6] 160, a super abrasion furnace black (SAF) with an average particle

[6] Columbian Carbon Co. trade marks.
[7] Millimicron, $m\mu$ = 0.001-micron.

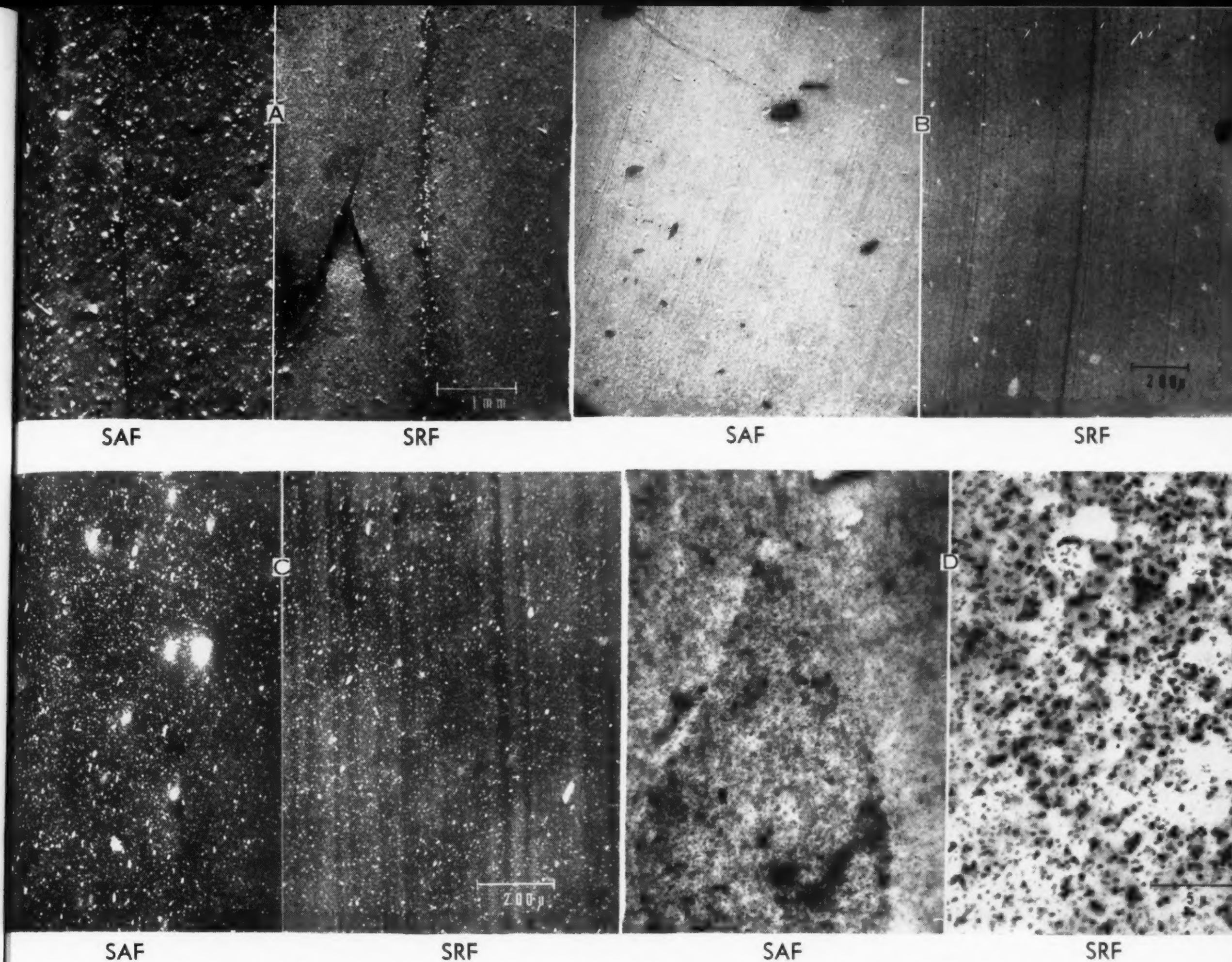


Fig. 4. Difference in dispersion behavior of fine (SAF) and coarser (SRF) blacks as evaluated by: A, photographic method; B, light microscope method; C, X-ray method; and D, electron microscope method

size in the range of 20 mμ.

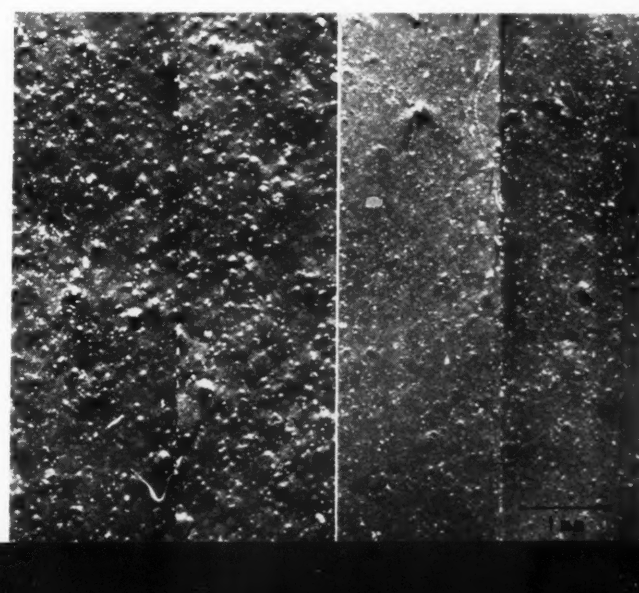
Both carbons were Banbury-mixed at 50-part loading in a low-temperature SBR tread compound. The dispersion differences are shown by the four methods of evaluating state of dispersion. It is observed that the SRF black dispersion is much superior to that for the SAF black.

The structure, surface chemistry, and physical state of carbon black are also important factors in dispersion, but a detailed analysis of their effects is not possible in this paper. The poorer dispersion of channel black in SBR, compared to HAF black, as demonstrated in Figure 5, is ascribed to its lower structure and different surface chemistry.

Polymer

The dispersion of carbon black is also influenced significantly by the polymer, with LTP SBR less effective with the finer reinforcing carbons than the oil-extended SBR (or OEP, oil-extended polymer), natural, or butyl rubbers, as evidenced by the series of dispersion photographs in Figures 6A, 6B, 6C, and 6D inclusive. The relatively easy dispersing SRF black is little affected by the type of polymer in its dispersion behavior, whereas the more difficult-dispersing SAF black is definitely influenced in its dispersion behavior by the type of polymer. This improved dispersion activity of the OEP, natural, and butyl polymers is ascribed in part at least to their higher molecular weight and to their higher viscosity during the early stages of mixing. Improved

Fig. 5. Poorer dispersion of channel, as compared with HAF black (*at right*) in SBR (50 phr.) examined by photographic method



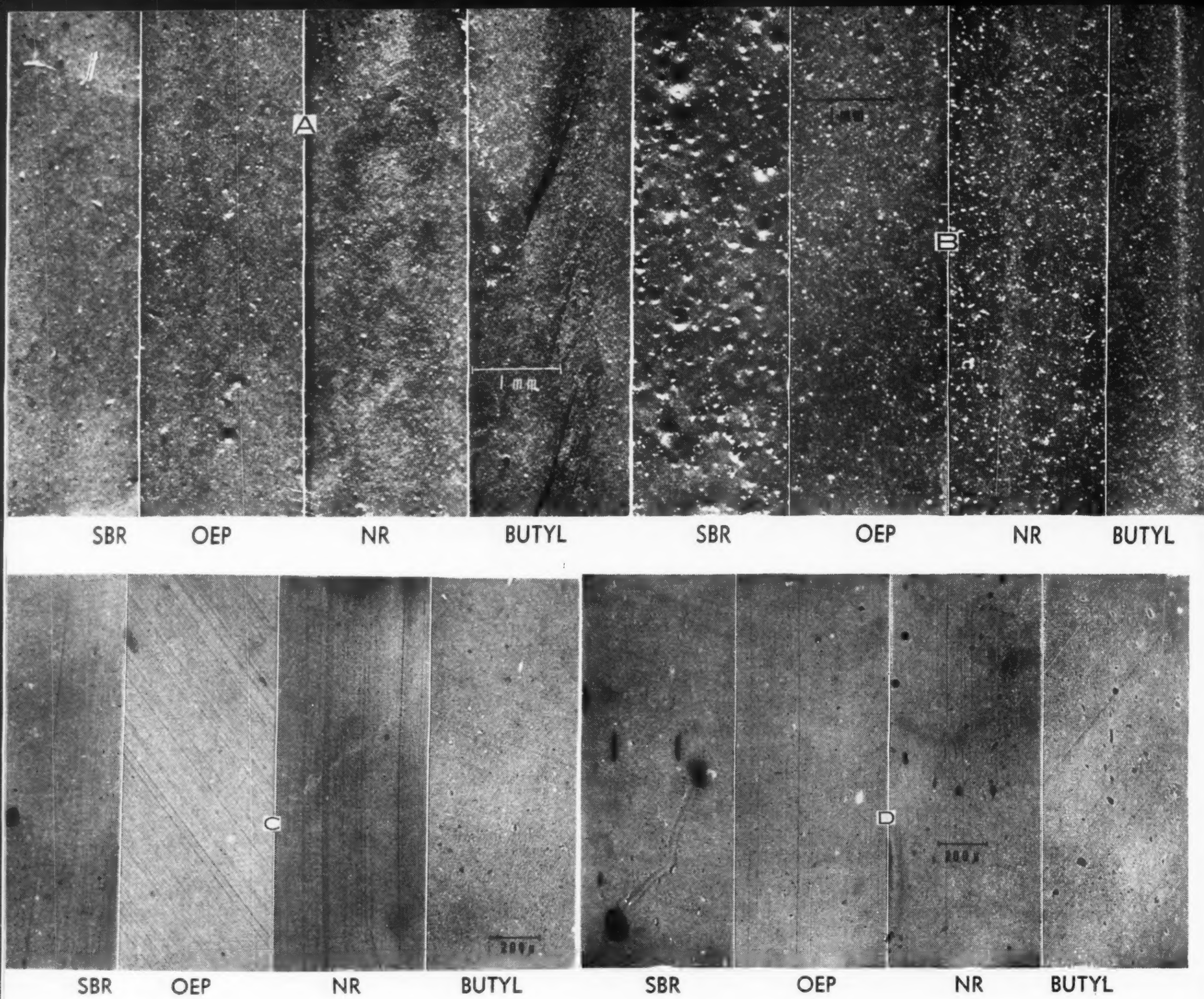


Fig. 6. Normal dispersion of SRF and SAF blacks (50 phr.) in SBR, oil extended SBR, natural, and butyl rubbers. A and B are examples of SRF and SAF dispersion as examined by photographic method. C and D are examples of SRF and SAF dispersion as examined by light microscope method

wetting characteristics of these polymers may also be a factor.

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(*To be continued*)

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The Influence of Particle Size On the Viscosity of Synthetic Latex—I[1]

Effect of Polydispersity

By PAUL H. JOHNSON and ROBERT H. KELSEY
The Firestone Tire & Rubber Co., Akron, O.

THE use of synthetic latex for foamed rubber or other latex applications has frequently been limited by the inability to obtain sufficiently high solids at a practical viscosity either from the reactor or by subsequent concentration. The use of low initial soap in the polymerization charge along with subsequent incremental stabilizer additions has been of value in making medium high solids latices of 55-57% solids, and in the case of SBR-2105 as much as 60% solids are obtained by heat concentration after polymerization. These techniques however, create some degree of difficulty either by increasing the polymerization time or interfering with the polymerization process by causing the reaction to die out and/or producing excessively high peak viscosity of the batch.

Since the particle size is known to affect the viscosity of latex emulsions when concentrated, it seemed desirable to examine in detail the extent of this effect as well as the influence of particle size distribution by blending latices of various particle sizes.

Many authors have given consideration to the effect of polydispersity of particles upon the density and the behavior of aggregates of various compositions. DallaVale[2] in the book, "Micromeritics," came to the conclusion that a minimum void volume in a system of two sized particles was attained when the mass of large particles constituted at least 70% of the total mass. Furnas[3] indicated a value of 65 to 70%. Maron and Madow[4] working with Type III[5] and Type V[6] latex showed that a minimum viscosity was obtained when a mixture contained 74% of the polymer mass as the larger particles.

These and many others who have contributed to this field have presented very elegant and rigorous mathematical interpretations that have come to be regarded as basic considerations. The work presented here is in harmony with these concepts, but it is felt that some extension of information has been made, especially in the sense of practical application.

This paper covers work done with three latices, the modal particle diameters of which, as determined with the electron microscope, were 950, 1710, and 3250 Angstrom units (A. U.),[7] respectively.

Apparatus and Methods

Preparation of Latices

The latices used in this investigation were prepared in a persulfate emulsion polymerization system using an alkyl sodium sulfonate (Du Pont Aquarex G) emulsifier. Polymerizations were carried out at 70° C. in a bottle polymerizer, using 28-ounce bottles with end-over-end agitation.

This system was chosen because a wide range of relatively uniform particle sizes could be obtained in an essentially single system. The final latices were adjusted to obtain material uniformity by adding ingredients in the proper amounts to bring electrolyte and emulsifier to the same level. Post-polymerization stabilizers, consisting of two parts of Neofat K242[8] and 1½ parts of potassium oleate, were added to each latex.

Concentrations of Latices

Concentration was effected by the use of an infrared lamp directed at the surface of the latex, while the mass of latex being concentrated was agitated continuously. A stream of air was blown across the surface to insure rapid removal of water vapor. In this manner skinning and heat coagulation were kept to a minimum.

Latex Viscosity and Particle Size Measurements

A Brookfield[9] viscosimeter, Model LVF, was used to determine the viscosity of the latex. Different numbered spindles were used at 60 r.p.m. as conditions dictated. It is realized that the results obtained with this instrument, especially on latex at high viscosities, are not absolute values because of the non-Newtonian behavior

[1] Presented before the Division of Rubber Chemistry, ACS, Cincinnati, O., May 14, 1958.
[2] J. M. DallaVale, Micromeritics," Pitman Publishing Corp., New York (1948).
[3] *Ind. Eng. Chem.*, 23, 1052 (1931).
[4] Maron and Madow, *J. Colloid Sci.*, 8, 300 (1953).
[5] A former GR-S latex designation for a 50/50 styrene-butadiene copolymer polymerized in a persulfate system with potassium rosinate soap. The particle size was about 1100 A. U.
[6] A former GR-S latex designation for a 70/30 styrene-butadiene copolymer polymerized in a persulfate system using sodium rosinate soap and stabilized with potassium oleate. The particle size was about 2000 A. U.
[7] One Angstrom unit equals 10^{-7} mm.
[8] Potassium salt of disproportionated refined tall oil, Armour & Co., Chicago, Ill.
[9] Brookfield Engineering Laboratories, Inc., Stoughton, Mass.

Particle Size Influence on Synthetic Latex Viscosity

Three 30/70 styrene-butadiene latices were made in a single system with modal particle diameters, as determined with the electron microscope, of 950, 1710, and 3250 Angstrom units, respectively. These latices were concentrated alone and in various blend ratios of small, medium and large particles. Viscosities as run with the Brookfield viscometer during the course of concentration showed the behavior was normal and confirmed the fact that larger particle size latices are more fluid than those of small particle size.

The influence of particle size distribution was examined in blends of the latices in various combinations of sizes. Blends of 950 A. U. with 3250 A. U. diameters were made on an equal mass and on an equal surface basis, and both mixtures had more favorable viscosity characteristics than did either of the single latices. Blends on an equal surface basis could be taken to 67.5% solids.

Other experiments involving blends of widely different number distribution showed that the mass relation of large and small particles gave a more significant indication of the viscosity behavior. Favorable viscosity was shown to be dependent upon: (1) Particle size; the larger the particles the more fluid is the latex. (2) Particle size distribution; the difference between the size of the large and the small particles should be as large as possible, and the mass of the large particle should constitute about 75% of the total mass of the particles.

TABLE 1. LATEX CHARACTERISTICS

Latex	A	B	C
Modal particle diameter (A. U.)	950	1710	3250
Viscosity at 60% T. S. (cps.)	8000	1800	250
Solids at 1000 cps. (%)	55	59	63

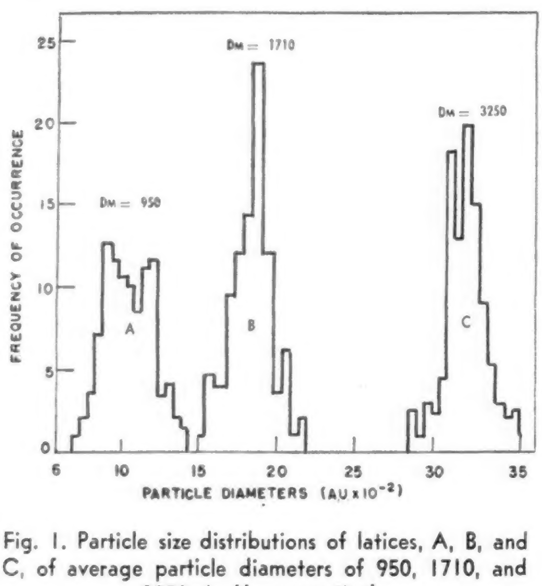

Fig. 1. Particle size distributions of latices, A, B, and C, of average particle diameters of 950, 1710, and 3250 A. U., respectively

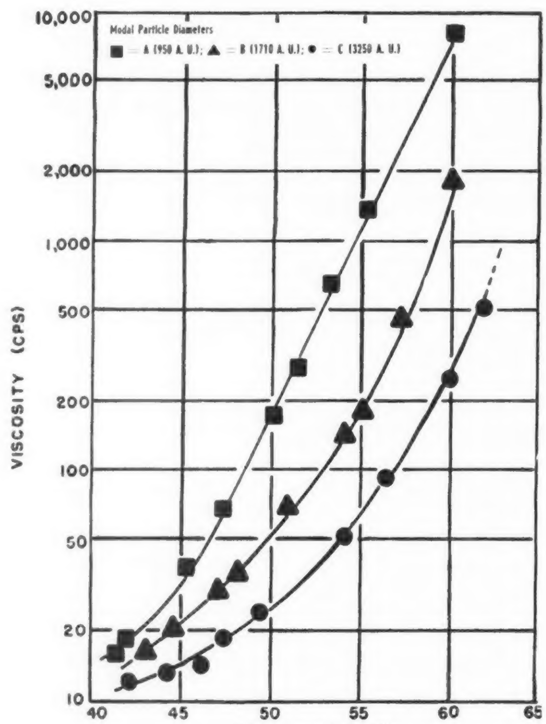

Fig. 2. Viscosity vs. total solids of latices A, B, C

of latex. They are, however, considered comparable since the same instrument was used throughout the investigation.

Latex particle size was measured with an electron microscope RCA[10] Model EMU-1.

[10] Radio Corp. of America, New York, N. Y.

Experimental Results

In Table 1 are listed some of the characteristics of the latices used. As the particle size increased, the viscosity at 60% solids decreased, and the solids at which the latex viscosity reached 1000 cps. increased. This value represents an upper limit of practical usefulness.

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Paul H. Johnson, research chemist, Firestone Tire & Rubber Co., received his A.B. degree in 1936 from Bethany College and his M.A. from Indiana University in 1937.

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Robert H. Kelsey, research physicist at Firestone, attended the University of Akron, Case Institute of Technology, and the University of Minnesota. He received his B.S. from the University of Akron in 1938.

Mr. Kelsey has been with Firestone since 1940.

He is a member of the American Physical Society and the Electron Microscope Society and is an associate member of the Division of Rubber Chemistry, ACS.

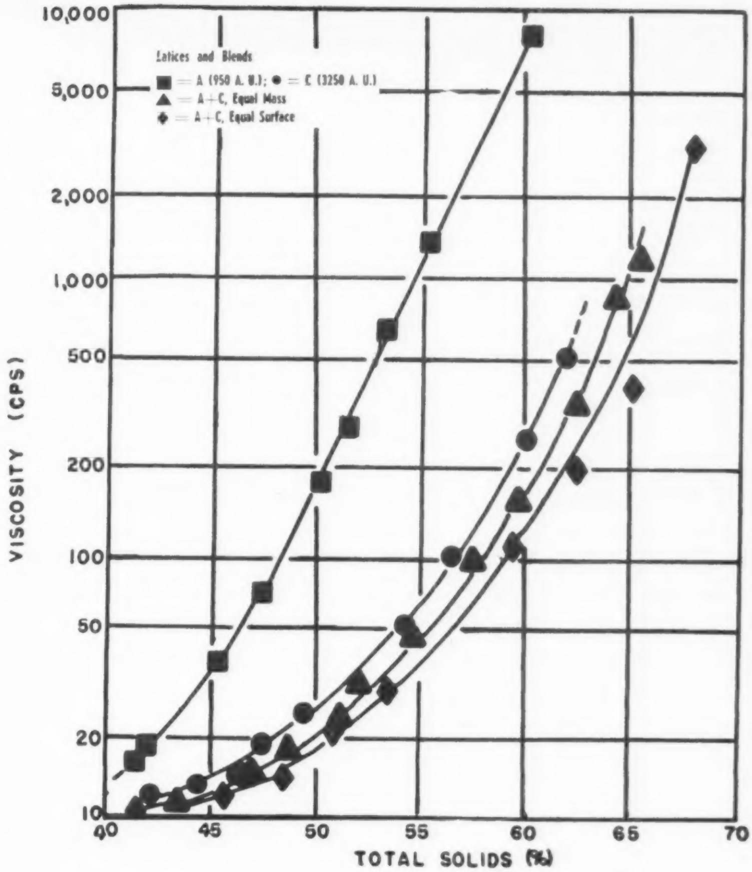

Fig. 3. Viscosity vs. total solids of blends of latices A and C

The number distribution of particles in these latices is shown in the histograms of Figure 1. The ranges are relatively small, providing a desirable degree of uniformity.

The behavior of these latices on heat concentration is shown in Figure 2, where solids are plotted against the viscosity in centipoises. The shape of the curves is normal for latices in general, and their position with respect to each other conforms to the well-known fact that an increase in particle size produces a very large decrease in viscosity at a particular solids.

Particle Size Distribution Effect

The influence of particle size distribution was examined by first blending the smallest with the largest particles. Two blends were made, one to give equal surface, and the other equal mass of large and small particles.

In Figure 3 it can be seen that the blends had more favorable viscosity characteristics than either one of the single latices. The blend composed of equal surfaces of large and small particles could be concentrated to 67% solids before reaching 1000 cps. viscosity.

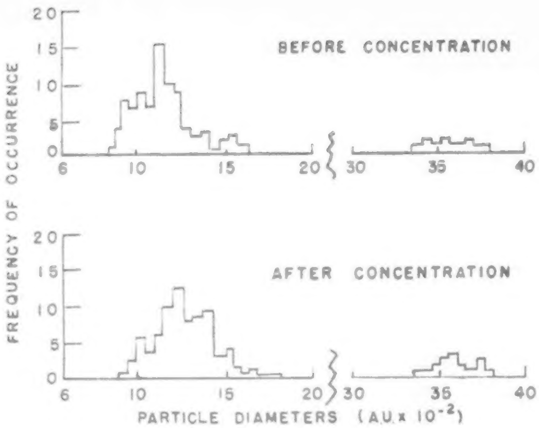

Fig. 4 Particle size distribution, blends of latices A (950 A. U.) and C (3250 A. U.) before and after concentration

This behavior might be explained on the basis of particle coalescence during concentration. In order to evaluate this possibility, an examination of the particle size before and after concentration was made on a single latex and a blend of two latices. An examination of Figure 4, which shows the particle distribution of a blend, reveals that no greatly significant change took place during concentration. The range of particles was essentially identical, and the small differences in shape and peak of the distribution fall within the possible variation that one would normally expect from the electron microscope technique. These results indicate that the favorite viscosity of the blends is an effect of particle size distribution rather than coalescence.

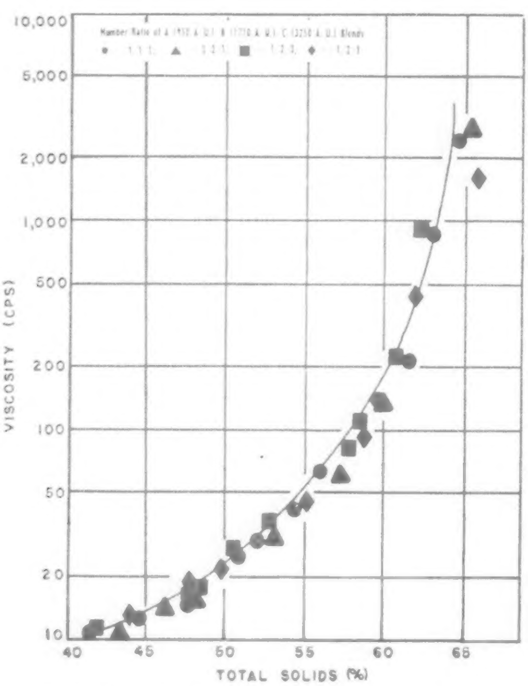

Fig. 5. Viscosity vs. total solids for blends of latices A, B, C, in various number ratios of the 3 particle sizes

Particle Size Number Distribution Effect

To examine the effect of particle size number distribution, blends of latices of the three particle sizes were made in such a manner as to give the relative distribution shown in Table 2. These blends constitute a wide variance in number distribution. No. 1 would be a flat distribution; No. 2 skewed to the left; No. 3 skewed to the right; and No. 4 peaked at the middle.

The viscosities of these blends on being concentrated are shown in Figure 5. The points of all blends fall essentially on a single line. This result was not expected since the number distribution varies so widely. An examination of the mass relation of the particles reveals however, a common characteristic that explains their behavior.

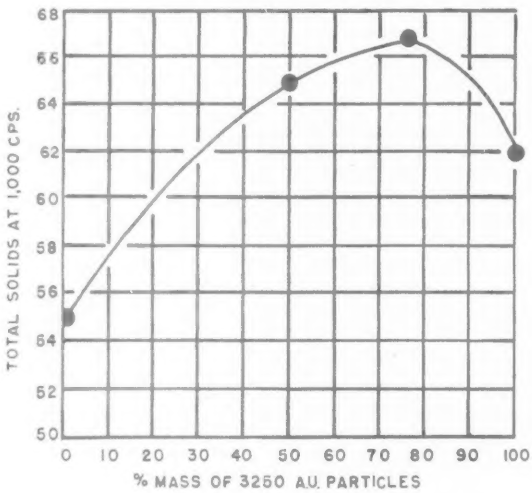

Fig. 6. Effect of polydispersity on total solids of latex at 1000 cps. viscosity. Blends of latices A and C in various mass ratios

Table 3 shows the relative masses of these latex blends. It will be noted that the mass of large particles exceeded 75% or 94%, depending whether the medium particles were considered as small or large. Although the number distribution varied widely, the mass of large plus medium particles was always in excess of 94%.

These results suggest the possible importance of the mass relation between large and small particles as the factor most convenient for predicting viscosity behavior. Using the mass relation for the blend that was made on an equal surface basis for the 950 A. U. and 3250 A. U. particles which had the most favorable viscosity, a ratio of 1/3.42 small to large particles is found. Thus the large particles constituted about 76% of the total particle mass. This figure is very close to the value of 74% which was found by Maron and Madow to be the most favorable.

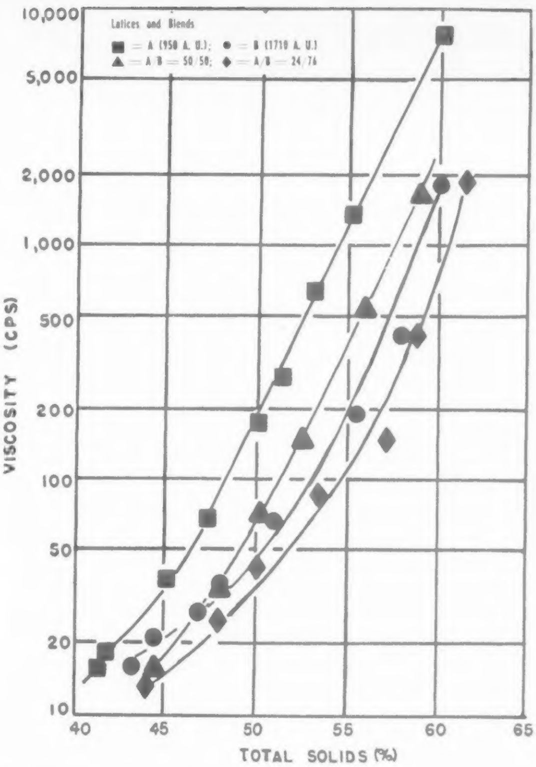

Fig. 7. Viscosity *vs.* total solids for blends of latices A and B on a 50/50 and 24/76 mass basis

Effect of Polydispersity

In Figure 6 the solids at 1000 cps. are plotted against the mass % of large particles present in the 950-3250 A. U. mixture. The curve rises through a maximum at approximately 75% mass of large particles and falls off again to the viscosity obtained with 100% large particles.

Using this curve it can be seen that with the blends in which all three latices were used, the medium particles were logically considered as a part of the large since a blend with 94% large particles would have the observed solids of 64% at 1000 cps.

TABLE 3. MASS RELATION OF LATEX BLENDS

Latex	Mean Dia. A. U.	Mass % of Particles—Blend 1	2	3	4
A	950	2.0	5.2	0.7	1.9
B	1710	9.8	17.2	6.9	18.1
C	3250	88.2	77.5	92.4	80.0
B + C		98.0	94.7	99.3	98.1
Solids @ 1000 cps.		64.0	64.0	64.0	64.0

TABLE 2. BLENDS OF THREE DIFFERENT PARTICLE SIZE LATICES

Latex particle size (A. U.)	950	1710	3250
Relative number of particles in blend No.			
1	1	1	1
2	3	2	1
3	1	2	3
4	1	2	1

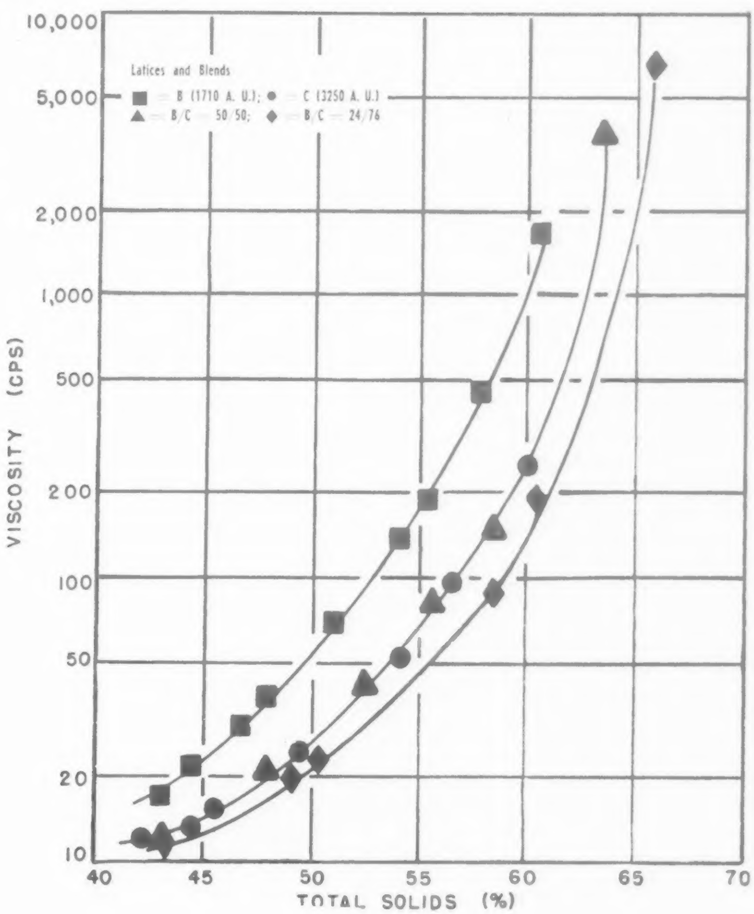

Fig. 8. Viscosity *vs.* total solids for blends of latices B and C on a 50/50 and 24/76 mass basis

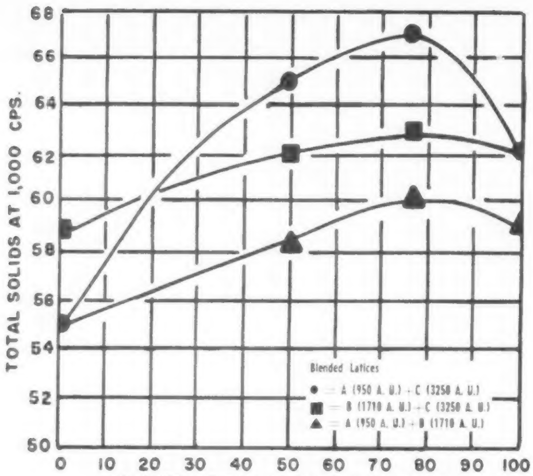

Fig. 9. Relation between mass % of large particles and total solids at which viscosity reaches 1000 cps.

The effect of the difference in particle size between two blended latices was examined by making blends on a mass basis in a ratio of 50/50 and 24/76 small to large particles. These blends were made by mixing: (A) 950 A. U. with (B) 1710 A. U. partic'es and (B) 1710 A. U. with (C) 3250 A. U. particles. The viscosity behavior of these blends is shown in Figure 7 and 8. As was shown previously with the blend of 950 and 3250 A. U. particles, the 24/76 (small/large) had a more favorable viscosity-solids relation than did either of the latices comprising the blend. Figure 9 summarizes the effect by showing the relation between the solids at 1000 cps. and the mass % of larger particles present in the blend.

These curves are similar to the curve found with the blends of 950 and 3250 A. U. particles. The peaks are at the same value representing the mass % of large particles, but the solids at 1000 cps. are lower, depending upon the spread in particle size as well as the actual size. The most advantageous viscosity was obtained when the difference in particle size was greatest.

It will be noted in Figure 7 that the blend on a 50/50 mass basis of 950 and 1710 A. U. particles, falls between the viscosity curve of the two single latices. In Figure 8 the 50/50 blend of 1710 with 3250 A. U. particles falls on the curve of the larger particles. This result would be predicted from the relation shown in Figure 9, where in the case of the latter blend the solids at 1000 cps. coincidently is the same as that of the large particles. In the former case the blend reached 1000 cps. at a value between the single latices.

Discussion

Although a later paper will deal with the theory involved in the observed phenomenon, it might be well to point out a few simple considerations. During the process of concentrating a latex the surfaces of the spherical particles come closer and closer together, arranging themselves in some array, depending upon the distribution of sizes. At a point where the viscosity approaches infinity, there is still a relatively large volume void of polymer in the total volume occupied by the latex, and at the solids content where 1000 cps. is reached, this volume is large enough to permit the introduction of significant numbers of smaller sized particles, without interfering greatly with the movement of particles in the latex serum.

From a practical standpoint the industry accomplishes this favorable relation of particle sizes by starting polymerization with small amounts of soap which favor the production of large particle sizes. Later, for the purpose of stability, more and more soap is added in several increments. These soap additions favor the production of small particles, but, since the large particles are already formed, this works to advantage. Thus SBR 2105 and latices similar to the former GR-S Type V have relatively good viscosity characteristics.

Summary and Conclusions

The viscosity of synthetic latex is favorably influenced by large particle size. Of even greater influence, however, is the relation between the mass of large and small partic'es present. The large particles should constitute approximately 75% of the polymer mass, and the difference between large and small diameters should be great in order to obtain the most favorable viscosity.

Acknowledgment

The authors wish to express their appreciation to Mrs. Betty Haney Myers for assistance in the work with the electron microscope, and to the Firestone Tire & Rubber Co. for its permission to publish this work.

Nylon a Must for Off-the-Road Tires

C. W. Moss, Goodyear Tire & Rubber Co., in a paper before the national West Coast meeting of the Society of Automotive Engineers in Los Angeles, Calif., August 11-14, has emphasized that nylon cord is standard in off-the-road tires for the entire industry.

Without nylon cord the present degree of performance of off-the-road tires could not be reached, it was said, since its resistance to bruise and deterioration from water, and the fact that less heat is built up in a nylon tire and that nylon resists heat better than any other cord material are factors that make nylon a must for such tires.

The full title of Moss's paper was "Rubber Tires for Heavy Construction Equipment," and it also covered tire temperatures, cord adhesion, etc.

The St. Joe Ozone Flex Tester For Rubber Compounds[1]

By L. E. CARLSON and R. S. HAVENHILL
St. Joseph Lead Co., Monaca, Pa.

THE cracking effect of ozone on rubber and rubber-like compounds has long been recognized. This problem has been extensively studied by many investigators referred to in the comprehensive bibliographies in reports of investigation by Newton (1),[2] Gaughan (2), and others.

In recent years the increasing popularity of the white sidewall tire has made the problem of ozone cracking a prime consideration for tire producers. Cracking which would be overlooked in a black stock will not be tolerated in a white sidewall, chosen primarily for appearance. In an effort to help in the study of white sidewall protection against ozone, the St. Joe ozone flex tester for rubber was developed. Although developed primarily for white sidewall stocks, the tester has been found to be of increasing utility in evaluating stocks for mechanical goods and other uses involving ozone resistance when subjected to mild dynamic stresses.

Several machines had been developed for static exposure and for exposure involving dynamic stresses in tension (3-9). Most of these machines, however, were quite bulky. It was felt that there was also a need of a smaller machine which would test small specimens, giving both static and dynamic exposure. Equivalent surface stresses in tension on the surface of a strip of rubber may be obtained by the use of much less force through bending than through straight tension pull. Actual service conditions would be more closely simulated by bending. Accordingly, a tester based upon the bending principle was designed.

Much of the need of elaborate controls in maintaining ozone concentrations at duplicable levels is due to the changing concentration of ozone in the surrounding atmosphere. For this reason it was decided to use compressed air which is ozone-free and energize it with an ultra-violet bulb to give a reproducible cracking environment of ozonized air.

Machine Description

The tester (Figure 1) is essentially a glass-enclosed working chamber in which aluminum jaws flex five rubber specimens (Figure 2) in an atmosphere of ozonized air. All of the large elements, housed in the eight-liter glass working chamber, are constructed of aluminum because of its relative inertness to ozone.

Ozone is supplied by air passing around an ultra-violet lamp housed in an aluminum container within the chamber. A 40-watt Mazda bulb wired in series with the Westinghouse #794 Sterilamp ultra-violet

[1] Presented before the Division of Rubber Chemistry, ACS, Cincinnati, O., May 14, 1958.
[2] Numbers in parentheses refer to Bibliography items at end of this article.

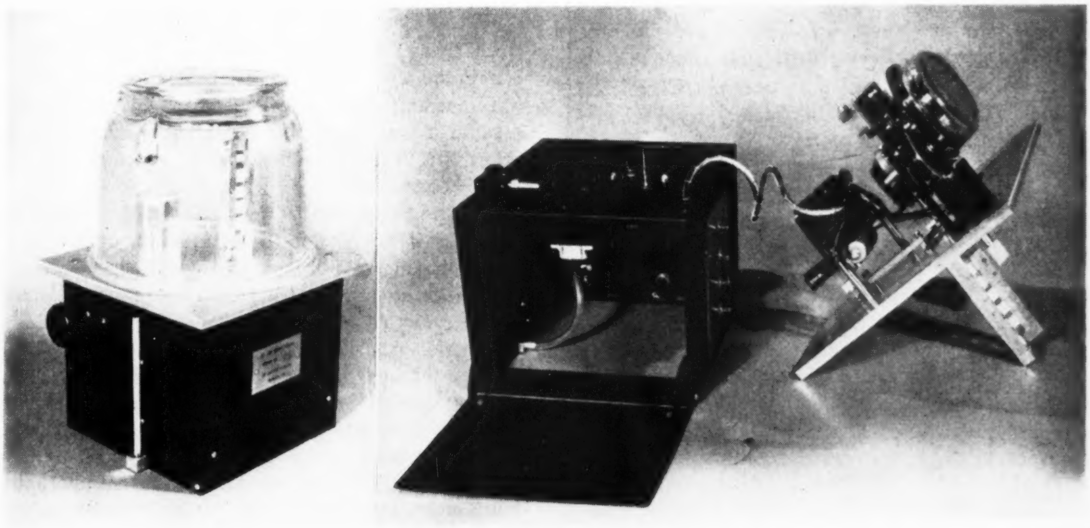

Fig. 1. St. Joe ozone flex tester for rubber: assembled, *left;* with top removed, *right*

R. S. Havenhill

L. E. Carlson

The Authors

R. S. Havenhill, assistant director, product and service laboratories, and director of the rubber research laboratories, St. Joseph Lead Co., received his B.S. in chemical engineering from the University of Kansas in 1925.

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He is a member of the American Chemical Society, Alpha Chi Sigma, Tau Beta Pi, and Sigma Xi and also is chairman of the subcommittee on low-temperature tests of Committee D-11 on Rubber of the American Society for Testing Materials.

L. E. Carlson, assistant director of the rubber research laboratories, in 1942 received his B.S. in metallurgical engineering from South Dakota School of Mines & Technology.

Mr. Carlson joined St. Joseph Lead Co. in 1942 as a research engineer.

He is a member of the American Chemical Society and the American Society for Testing Materials.

source acts as a current regulator. An air flow of 0.1-cubic meter per hour is controlled by a pressure regulator which drops 90-psi. line pressure to a regulated pressure of 30 psi. Output of the regulator is throttled by a special needle valve which regulates the flow to the approximate desired range.

Fine adjustments of flow are made by slight readjustments of the pressure regulator, and air flow is measured by a built-in rotameter. The automatically controlled air flow is introduced through the ultra-violet lamp base into the aluminum housing. After being ozonized by circulating around the lamp, the air is discharged through a distributor jet into the working

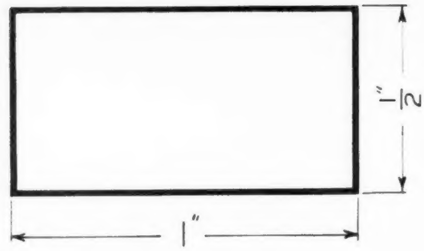

Fig. 2. Diagram of test specimen died from 0.075-inch tensile test sheet

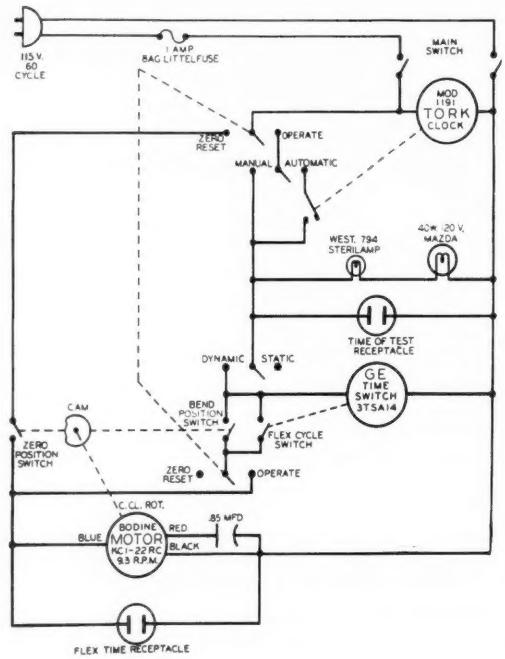

Fig. 3. Wiring diagram for St. Joe ozone flex tester

chamber and ultimately exhausted through a drilled port in the aluminum base of the chamber.

Temperature control was not built into the machine, because it was found that temperature equilibrium of about 10° F. above room temperature was established in 3½ hours.

A built-in time switch (Figure 3) automatically turns on the jaw flex motor 10 minutes out of the hour. When the motor is running, it flexes the specimens through an angle of 120 degrees (Figure 4) at the rate of 9.3 cycles per minute. At the end of the 10-minute flex period, the jaws automatically assume the bend position through the action of a cam-operated switch. Another cam-operated switch enables one to straighten the jaws automatically at the end of the test, thus facilitating removal and introduction of specimens.

A second timer automatically starts and stops the machine at some previously determined time cycle (usually seven hours). Thus it is possible conveniently to run a test during the day and another during the night. A check on the timers can be made by plugging a

The St. Joe Ozone Flex Tester for Rubber Compounds

A new laboratory machine for evaluating the ozone resistance of rubber compounds under static and dynamic conditions is described. The machine is compact (17 inches high, 12 inches square base) and tests small specimens (1/2- by one inch) easily obtainable from standard tensile sheets.

The ozone concentration of approximately 50 parts per hundred million is maintained constant by passing a controlled quantity of compressed air (which is ozone-free) past a Westinghouse #794 Sterilamp.

Throughout the normal seven-hour test period, the five specimens are automatically cycled through 10 minutes of flexing and 50 minutes of static bend stress. The dynamic feature of the test is considered essential, since some additives which improve static ozone resistance actually accelerate dynamic attack.

The human element in rating degree of attack has been eliminated by measuring band modulus with a special beam balance before and after exposure.

Electrostatic contact potential of rubber oriented by stretching is shown to be more negative than for unstretched rubber, which could account for the more rapid ozone attack on stretched rubber.

Results obtained with the new machine have shown good correlation with actual road tests that were conducted on white sidewalls tires in the Los Angeles area.

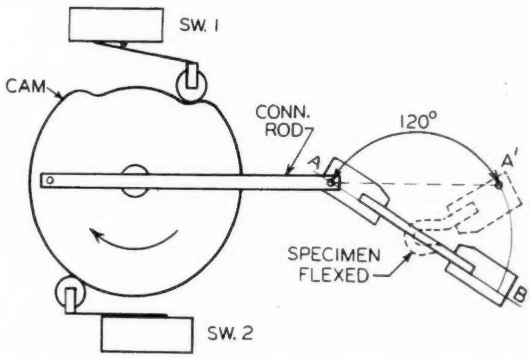

Fig. 4. Schematic diagram of flexing mechanism

regular electric clock into either of two receptacles on the back of the instrument and determining the total flex time or total time of test.

Ozone Concentration

Ozone concentration in the working chamber was measured by two independent methods which gave results of the same order of magnitude. A modified Crabtree-Kemp determination (10) gave an estimated concentration of 50 pphm. A specially constructed Goodrich Ozonometer (11) obtained from A. E. Juve checked this figure fairly well. The modifications to the Crabtree-Kemp determination included the use of a Milligan bubbler to replace the spray chamber, and an absorption solution as suggested by the Wadelin (12) modification of ASTM D 1149-55T.[3] The Milligan bubbler has been shown to give results comparable to those obtained with the absorption tubes developed by the Goodrich Research Center, and the Crabtree-Kemp spray chamber (13).

[3] American Society for Testing Materials, Philadelphia, Pa.

Description of Attack Rater

Measurement of the degree of cracking caused by ozone has hindered all investigators in this field. Many ingenious methods of rating have been developed (5, 14-16). Since a few large cracks tend to be more detrimental to both modulus and appearance than many very fine cracks, the writers felt that some kind of modulus measurement might be a very usable rating device. Accordingly, a beam balance (Figure 5) was constructed which gave a measure of the force required to hold a specimen bent to a degree comparable to that experienced in the actual exposure test. Ozone resistance ratings were obtained by expressing bend modulus readings after testing as a percentage of readings before testing.

These bend modulus ratings, made on a wide variety of compounds, were found to correlate well with visual ratings, which latter were the averages of the results obtained by two independent observers in the authors' laboratory. (See Figure 6.) The visual rating scale started at zero for no apparent attack and went to 15 for complete breakdown of the strip.

Compounds with high permanent set show some

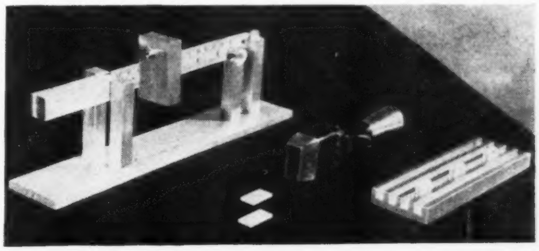

Fig. 5. Beam balance and other equipment used for determining degree of ozone cracking

TABLE 1. TEST RECIPES

	A	B	C
Natural rubber	100.0	100.0	100.0
Sulfur	3.5	3.5	3.5
MBT (Captax)	0.6	0.6	0.6
Stearic acid	1.5	2.0	2.0
ZnO black No. 20	5.0	113.0	113.0
Paraffin wax	—	—	6.0
	110.6	219.1	225.1

bend modulus decrease after flexing, even when unexposed to ozone. For such compounds the test period should be made long enough so that the ozone cracking effect is large in comparison to the permanent set effect.

There was some question how the thickness variations ordinarily encountered in regular tensile sheet molding might affect the validity of the rating device. It was found that, although the bend modulus for a particular compound is proportional to the cube of the thickness, the thickness correction apparently cancels out in arriving at the percentage modulus retained figure. This is shown in Figure 7, where a compound was molded in a wide range of thickness. The strips of differing thickness were given simultaneous exposure and were rated in the attack rater. Since the ratings appeared to be almost independent of thickness in the wide range considered, it strongly suggests that the narrow range of thickness variation of tensile sheets would have inappreciable effect on the test.

Discussion of Results

Figure 8 demonstrates the need of a dynamic component in an ozone test for rubber. Stocks B and C (Table 1) which had been cured 10 minutes at 274° F. are represented on the graphs. The pre-stressed strips which were statically exposed for seven hours were protected by six parts of wax. The wax, however, was deleterious for the regular seven-hour test with the dynamic component.

It is felt that rubber which is subjected to both static and dynamic stresses in service, as most rubber is, should be tested with a programmed cycle of both service conditions than would be possible with either straight static or straight dynamic stressing. This machine puts a stress on the outer surface of the test specimen, which gives a maximum elongation of about 40%. Thus, the specimen passes through the so-called critical elongation range of approximately 20% (4, 1, 17) twice each flexing cycle; and part of the strip is in this range during all of the static bend period.

The rate of flexing chosen was relatively slow (9.3 flex cycles per minute), merely enough to crack any inflexible protective films of wax or other brittle material without supplying enough energy to cause heat failure or fatigue in the rubber. Inflexible films are actually worse than no films, since stresses and resultant cracking of rubber are localized and intensified at the points of film failure.

Neoprene when exposed to ozone, apparently forms a flexible ozonide. It has been demonstrated that neoprene reacts with ozone (18), but the fact that neoprene has good apparent ozone resistance is quite probably due to the formation of flexible ozonide which bends as readily as the polymer itself.

Road Test Comparison

About 40 white sidewall stocks were road tested in an ozone cracking evaluation study (19). More than 200 test tires were made up from the stocks and were tested on private cars and test fleets in California, Texas, and other difficult service areas. Each compound was compared with a standard compound fabricated into the same tire. As is well known, road test evaluation of this type of stock is extremely difficult. Factors such as temperature, ozone concentration, operating speed, and many others exert their respective influence in varying degrees to alter, and in some extreme cases reverse, the ratings.

The same stocks obtained through the courtesy of R. T. LaPorte were also tested in the St. Joe flex tester. Figure 9 compares results on laboratory tests with road tests on three stocks typical of those tested in the Los

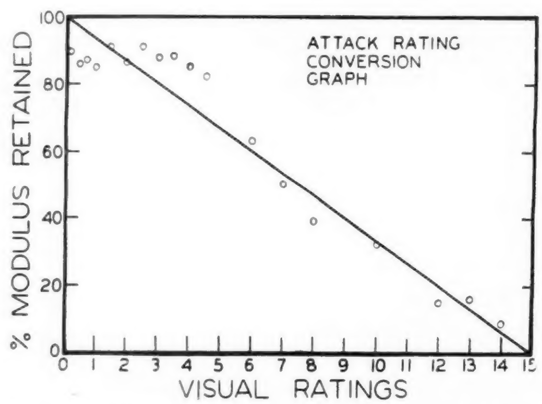

Fig. 6. Visual ratings of ozone attack vs. beam balance ratings expressed as % of bend modulus retained

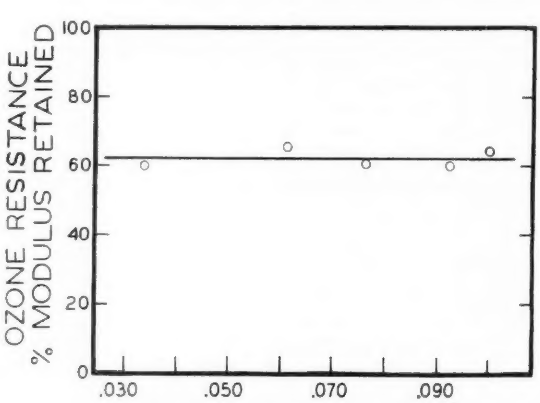

Fig. 7. Thickness of specimen vs. beam balance ratings

Angeles area. Taking into account the variability of road tests, correlation between these road tests and laboratory tests is quite good.

Electrostatic Tests

Curves in Figure 10 show the attack of ozone *versus* elongation and the contact potential of rubber *versus* elongation. Stocks A and B (Table 1) cured 40 minutes at 274° F. are represented. Contact potential was measured by stretching rubber to various elongations and stroking the rubber surface once with a mirror-surfaced steel-proof plane that was electrically grounded. The charge that was left on the rubber was measured by the St. Joe electrostatic modulator (20). The ozone attack curves were obtained in this instance from 23-hour static exposure tests of T-50[4] specimens that had been placed inside the ozone chamber in special elongation racks instead of in the regular flexing jaws.

After exposure, the strips were measured in the St.

[4] ASTM D 599-55.

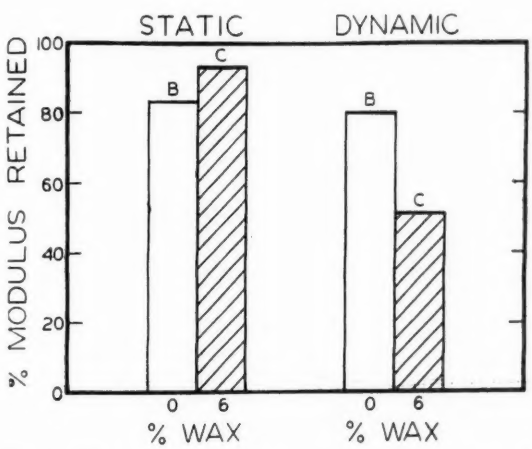

Fig. 8. Effect of wax in rubber compounds when tested with ozone under static and dynamic methods

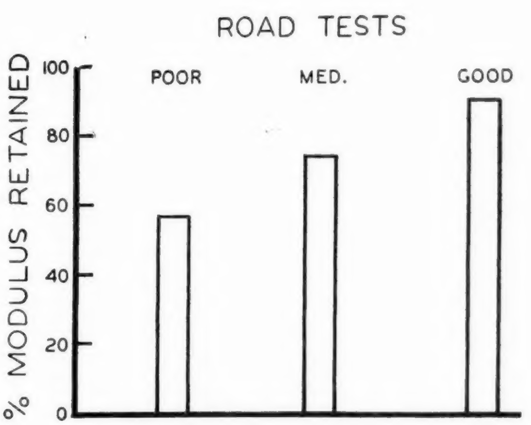

Fig. 9. Comparison of ozone tests on white sidewall stocks made by road testing tires and by the testing stocks in St. Joe ozone flex tester

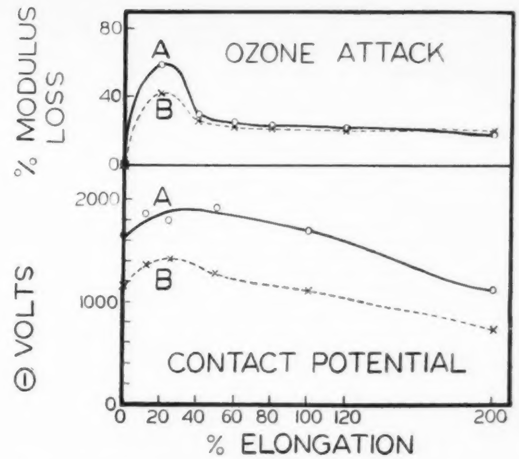

Fig. 10. Ozone attack ratings at various elongations (static test) compared with electrostatic contact potential at various ratings for low and high zinc oxide stocks

Joe attack rater that had been fitted with a lightweight rider to measure the small bend modulus of the specimen.

Maxima in the two curves were noted in roughly the same elongation range. These data are presented as a possible explanation of the critical static elongation for maximum ozone cracking damage referred to repeatedly in the literature (4, 1, 17). Since ozone attack is a type of oxidation and oxidation is a loss of electrons, it would seem to follow that anything that would increase the negativity of the rubber would give an excess of electrons and thereby promote ozone attack. It is felt that either static or dynamic stretching of rubber orients the molecules in certain stages of elongation to maximize the tendency to lose electrons, which would imply an elongation range of maximum chemical reactivity.

Powell and Gough (17) have stated that the critical static elongation for maximum deterioration by ozone is not due to chemical reactivity, but due exclusively to a changing pattern of stress relief. Stress relief, whether produced by cracking, permanent set, or dynamic flexing, is undoubtedly an important consideration in accounting for different cracking patterns with different elongations.

The present writers believe, however, that there is probably a range of maximum chemical reactivity that interplays with several other causes such as permeability (19, 21) and stress relief to determine the resultant critical elongation for maximum cracking damage. While this explanation of the critical elongation for maximum cracking damage refers primarily to a static elongation, it also applies to dynamic flexing since the specimen passes through the critical elongation at some point in the dynamic flexing cycle.

Summary and Conclusions

1. A new machine for testing rubber in ozonized air has been described which offers advantages of com-

pactness and a programmed cycle of static and mild dynamic stresses.

2. A rating device that measures the bend modulus of specimens before and after exposure has been developed, thus eliminating the human element in determining the extent of objectionable cracking.

3. A new hypothesis of ozone attack is stated in which negativity of rubber, as measured by contact potentials, is correlated with actual loss in bend strength caused by ozone.

4. Test results obtained with the new machine have shown good correlation with actual road tests on tires.

Acknowledgment

The authors wish to acknowledge the valuable assistance of the staff of the St. Joseph Lead Co., and particularly that of J. G. Wehn, plant manager; J. J. Rankin, production engineer; W. T. Neill; J. N. Strouss; and F. I. Hood, who have contributed to the preparation of this paper.

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Cotton-Rayon in Medium-Tension Conveyor Belt

In the years since World War II, researchers have focused special attention on textiles, the backbone of a conveyor belt. They have studied and tested more than 20 different synthetic textile combinations in the lab and in the field, and they have developed what they consider to be the best belt construction available in the top-grade medium tension range (30 to 75 pounds per ply per inch), according to Hewitt-Robins, Inc., Stamford, Conn. This construction consists of cotton, a fiber in use for 5,000 years, and rayon, the world's oldest synthetic fiber.

In this new cotton-rayon construction premium long-staple cotton in the length direction is woven crosswise with a new type of extra high-tenacity rayon. The rayon is a viscose type designed and engineered especially for conveyor service, states the manufacturer.

This cotton-rayon construction is claimed to outperform all other textiles in competition for best conveyor belt construction in medium-tension range. Below are listed the technical reasons why the cotton-rayon construction developed by Hewitt-Robins is said to produce a better belt than the cotton-nylon construction offered by most of the other belt manufacurers.

STRENGTH. Rayon in cotton-rayon belts has a larger diameter than nylon used in the cotton-nylon constructions; therefore, when the larger-diameter rayon is woven across the cotton, a larger crimp is placed in the cotton thread. This results in better interlocking of the threads, consequently, increased belt strength and an improved holding power for the metal fasteners used to join the belts. The cotton-rayon weave is also coarser, allowing better penetration of rubber into the interstices of the fabric. Because of much higher initial strength, the cotton-rayon construction is said to have higher strength when exposed to water than does cotton-nylon under similar moisture conditions.

RESILIENCE. The increased weight and bulk inherent in the cotton-rayon construction, combined with adequate crimp, result in greater resilience and shock absorption ability. Falling lumps of ore or rock are cushioned at the point of impact without damage to the belt. This locked-in resilience also improves the belt's ability to withstand starting stresses and the tensions caused by material build-up on pulleys and idlers. Thin belt fabrics are less resilient because they lack adequate weight and bulk, with the result that impact resistance is greatly reduced and the risk of damage from heavy lumps of material is increased.

FLEXIBILITY: Cotton-rayon belts have good flexibility and trough well, yet do not cling too closely to the idlers, causing unnecessary wear and grease pickup as do many of the limper cotton-nylon belts.

The successful combining of cotton and rayon to make better conveyor belts is an important advance in rubber technology. Researchers in the Hewitt-Robins rubber laboratory who pioneered cotton-rayon recently said that one of the nation's largest producers of synthetic textiles released a report of scientific tests which demonstrated the advantages of cotton-rayon over cotton-nylon construction. This report supported what Hewitt-Robins experience had already proved, according to the statements made by the company.

NEWS of the
RUBBER WORLD

The "Third Report of the Attorney General on Competition in the Synthetic Rubber Industry," in reviewing developments in this industry in 1957, seemed satisfied that continuing progress is being made towards a "free, competitive synthetic rubber industry." Although transition from a sellers' to a buyers' market led to more vigorous rivalry for customers last year, the Report decried "the almost complete lack of price competition in the industry."

General Electric Co. has announced a new-type nitrile silicone rubber said to combine oil resistance with the ability to maintain strength and usefulness at temperatures from minus 100 to plus 500 degrees F. The new silicone rubber, to be available by the year-end, is to be priced at about $15 a pound.

The American Institute of Management's latest book in its 10-category series on overall corporate management, this one entitled "Sales Vigor in the Corporation," was recently released. Ten years of research in this area of management study among top American and Canadian corporations are summed up in the book.

B. F. Goodrich Co.'s vice president, Guy Gundaker, Jr., reveals that industry six-month reports show that shipments of replacement passenger tires to retail outlets are running 3.6% higher than for the same period last year. He expects 1958 shipments to amount to more than 58 million units.

Stalwart Rubber Co. has perfected an exclusive technique for extruding and calendering complex shapes of silicone rubber sponge. Lower equipment costs coupled with high-volume production economies in calendering and extrusion provide customers with sharply reduced production costs.

RUBBER WORLD and the eight other magazines of the Bill Brothers Publications are moving to a new 22-story, air-conditioned building being erected at 630 Third Avenue at 41st Street in New York in October. Look us up in November! The new telephone number will be YUkon 6-4800.

MEETINGS and REPORTS

SRG Panels on Urethane Foam And Reclaimed Rubber

The Dinkler Plaza Hotel, Atlanta, Ga., was the locale of the Southern Rubber Group's summer meeting on June 13 and 14.

The affair was a two-day, two-panel discussion and was widely attended by more than 200 members and friends of the South's rapidly expanding rubber industry.

New SRG Officers

New officers and directors of the Group, elected at this meeting, were as follows: chairman, W. S. Hall, Phillips Chemical Co.; vice chairman, E. H. Ruch, Firestone Tire & Rubber Co.; secretary, E. J. Strube, E. I. du Pont de Nemours & Co., Inc.; treasurer, Ross Whitmore, Better Monkey Grip Co.; and directors, Tom Brown, The B. F. Goodrich Co.; Lenoir Black, The C. P. Hall Co.; and G. H. Boeder, Goodrich.

Incumbent directors are R. D. Baker, General Tire & Rubber Co., and Albert Koper, of the Harwick Standard Chemical Co.

The Two-Day Program

The June 13 panel discussion was on "Isocyanate Foams" and included E. J. Strube, Du Pont, as moderator, with L. W. Schnuelle, Hewitt-Robins, Inc., and Benjamin Collins, Nopco Chemical Co., as panel members.

The second panel discussion, "Reclaimed Rubber," was moderated by E. H. Ruch, Firestone. Panel members included J. E. Brothers, Ohio Rubber Co.; J. M. Ball, Midwest Rubber Reclaiming Co.; J. E. Misner, Xylos Rubber Co.; E. B. Busenburg, Goodrich; T. H. Fitzgerald, Naugatuck Chemical Division, United States Rubber Co.; and C. Huddleston, U. S. Rubber Reclaiming Co.

The Friday evening program featured Louis Reizenstein, Pennsylvania Industrial Chemical Corp., as after-dinner speaker. R. L. Holmes, General Asbestos & Rubber Co., served as master of ceremonies.

A hospitality hour followed the dinner-meeting.

Southern Rubber Group's isocyanate foam panel *(left to right)*: Moderator E. J. Strube, B. Collins, and L. W. Schnuelle

Isocyanate Foam Panel

"The Chemistry and Present Position of Flexible Urethane Foams," by L. W. Schnuelle, first emphasized that the secret of successful urethane foam production is to keep every phase of the process carefully controlled, beginning with raw material checkouts, tip-top equipment maintenance, and ending with careful checks on the physical properties of the finished product.

CHEMISTRY AND PROCESSING. Flexible urethane foams are made by reacting polyhydroxy resins with diisocyanates in the presence of catalysts and foam stabilizers. The primary reaction is between a polyhydroxy resin and an isocyanate to form a urethane. A secondary reaction, which nevertheless is essential to the foam process, is the reaction of diisocyanate with water to yield carbon dioxide gas.

The two basic types of flexible urethane foam are polyester foam and polyether foam. Polyester foam is made from resins derived from reacting dibasic acids with dihydroxy compounds. The polyesters used for flexible foams are usually made by esterification of a glycol such as diethylene glycol with adipic acid. Small amounts of polyfunctional alcohols may be added to the formulation to give some cross - linking between polyurethane chains. Polyester foams are usually easily identified, Schnuelle said, by their crisp feel, very uniform cell size, and lack of resilience.

Polyether foams are made from polypropylene ether glycols or modified resins based on polypropylene ether glycols. These foams usually have a relatively non-uniform cell structure and are more resilient than polyester foams, this speaker added.

In this country, mixed toluene diisocyanate isomers are generally used in making polyurethane foams. The early foams were made from polyesters and a mixture of 65% of 2,4 toluene diisocyanate (TDI) and 35% of 2,6 TDI. Although this mixture of TDI isomers is still used to some extent in foam production, the trend today seems to be toward using an 80/20 mixture with both polyesters and polypropylene ether glycols.

In the commercial preparation of slab urethane foam, resin, TDI, and a catalyst mixture are metered to the mixing head of the foam machine by separate pump systems. The resin, TDI, and catalyst mixture come from the nozzle of the mixing chamber as a rather thick liquid, and the mixture starts to foam within seconds after it has been deposited on the pouring belt. Foaming is completed in from one to three minutes. At the same time, cross-linking and polymer growth take place to give a gelled foam which can be handled in a matter of 10 to 20 minutes. This raw foam is then allowed to cure before cutting or shaping to desired size.

In the case of polyester foam, it is customary to store the slabs 24 hours at room temperature. This practice allows the foam to cool (temperatures at the center of the slab may reach 230° F.) and permits final shrinkage to take place so that accurate cutting can be done.

Polyether foams require additional curing if low compression set is desired and is accomplished by oven heating at elevated temperatures.

A typical polyester formula might call for 100 parts resin, 40 parts TDI, and eight parts catalyst mixture (an amine, water, and a foam stabilizer). A representative polyether formula would be similar except that the TDI is usually reached with the propylene ether glycol, by means of a cook cycle, to give a prepolymer with free isocyanate groups before it is metered to the mixing head.

RAW MATERIAL VARIATIONS. The manufacture of urethane foam is a sensitive chemical process, and often very minor variations in the quality or proportioning of ingredients can cause major variations in appearance and properties of the finished foam.

The Society of Plastics Industry has prepared tentative standard methods for chemical analysis of urethane foam raw materials. In general, raw material suppliers today are cognizant of the stringent requirements for all ingredients and make every effort to furnish suitable materials, Schnuelle declared.

Toluene diisocyanate is usually checked for hydrolyzable chlorine and for freezing point. The freezing point identifies the particular TDI mixture (65/35 isomer or 80/20 isomer) being tested, and the hydrolyzable chlorine content is a measure of the mixture's purity. The 80/20 TDI mixture can be obtained commercially with hydrolyzable chlorine contents varying from 0.005 to 0.020%. The reactivity of TDI is inversely proportional to the hydrolyzable chlorine content, Schnuelle said. Resins are usually checked for acid number, hydroxyl number, and water content. The hydroxyl number and water content are needed to make formula calculations in determining the amount of TDI needed.

Since water content must be kept to a minimum, 0.10% water content is usually the maximum allowable amount. Also, uniformity of catalysts and foam stabilizers is important. More or less conventional chemical tests can be used to insure the purity of these materials.

COMPOUNDING. Density of urethane foams can be varied by adjusting the TDI content. Water content is also adjusted on a stoichiometric basis along with changes in catalyst concentration when a change in density is desired.

Cell structure can be varied from coarse to fine by selection of emulsifiers and catalysts. Cell size can also be controlled by adjustments in the size of the nozzle on the mixing chamber, the speaker further declared.

Resilience, load bearing capacity, compression set, tensile strength, and elongation depend on the choice of resins, catalysts, emulsifiers, cross-linking agents (e.g. triols), and techniques used in making the prepolymer.

THE MARKET. The largest single application of urethane foam today is in the cushioning and padding field. Polyether foam, for example, is gaining acceptance in furniture, especially in the medium and low priced lines where standard rectangular shapes can easily be cut from commercial slabs. Latex foam is still used almost exclusively for more complicated shapes such as L-cushions, crescent cushions, and similar complex parts.

Polyester slab foam is currently used mostly for special applications and novelty items such as automotive headliners, wall tile, rug underlay, table mats, gaskets, sponges, paint rollers, ironing board pads, and sound-deadening panels.

Both polyester and polyether foams are being used as clothing liners.

URETHANE FOAM PROPERTIES. Several excellent papers on properties of flexible urethane foams have been published,[1] and an abbreviated summary of a comparison between urethane and latex foams (viewed as cushioning and padding materials) is tabulated below:

URETHANE AND LATEX FOAM AS CUSHIONING MATERIALS

Property	Urethane Foam	Latex Foam
Tensile strength and elongation	Superior	Poor
Load bearing capacity	Poor	Superior
Permanent set	Poor	Outstanding
Sunlight resistance	Rapidly discolors	Slowly discolors
Oxygen aging	Superior	Fair
Humid aging	Satisfactory	Good
Solvent resistance	Superior	Poor

THE FUTURE. Urethane foam production during 1957 has been estimated at 12 to 18 million pounds; while latex foam production for the same period was estimated to be between 180 to 200 million pounds.

The current estimated total foaming machine capacity is about 80 to 100 million pounds per year.

From these estimates it is easy to see the competitive pressures that have built up and the effect these pressures can have on selling prices. However it is no secret, according to Schnuelle, that most companies—or perhaps even all companies—are losing money today on their urethane foam lines.

Despite this loss, the future of urethane foam is bright, Schnuelle believes. Raw material prices are expected to drop as volume increases. For example, TDI was introduced in 1953 at $4.00 per pound, and it has now dropped to its current level of $0.95 per pound; and an eventual price level of $0.70 per pound has been predicted. Furthermore, scrap ratios (which currently run 30 to 90%, depending on product lines) are expected to decline as foam technology advances and production units become more efficient.

[1] J. H. Saunders, *et al.*, *Ind. Eng. Chem.*, Chemical and Engineering Data Series 3, 1, 153 (1958).

These factors should eventually permit efficient manufacturers to make a normal profit and may, in time, permit even lower selling prices than are prevalent in today's market.

There is no doubt that urethane foam has some definite advantages over latex foam, and we can expect urethane foam to be one of the bulk cushioning materials of the future.

Mr. Schnuelle answered the following questions:

Q. Are there ASTM test methods for urethane foams as there are for rubber latex foams?

A. Yes. Tentative ASTM test methods have been prepared and are currently being submitted to ASTM Committee D-11 members for vote.

Q. You mentioned large amounts of scrap. What is being done to reclaim same?

A. Most urethane foam trim and scrap are converted into a shredded form for filling hassocks, dolls, and similar items. Some work has been done to convert scrap back to liquid resin, but to date this has been impractical or uneconomic so far as we know.

Q. In latex foams, plasticizers and softeners are used to alter their properties. Can these be used in urethane foam? If so, what plasticizers have been considered?

A. Plasticizers can be used in urethane foam. In general, the ester-type plasticizers seem to be useful to improve low-temperature properties or to change resilience properties.

Q. Please give your opinion on urethane foam as a possible market replacement for non-latex rubber sponge products.

A. Urethane foam can be used in some cases in place of sponge rubber products. A urethane foam weather-stripping is being marketed successfully In general, die-cut gaskets from urethane foam sheet can sometimes be substituted for sponge rubber die-cut gaskets provided firmness is not critical and open-cell surface can be tolerated.

Q. Is slab urethane foam such as Curtiss Wright manufactures for laminating on carpets of the polyether or polyester type, and are cells closed or open in such foams?

A. Curtiss Wright does not disclose the composition of its urethane foam. It is generally believed, however, that this is a polyester-type foam. There is no reason why polyether foams could not be used if they were properly formulated for this application. All flexible urethane foams are predominantly open celled.

Q. Are there any data bulletins from the National Safety Council or other sources on maximum allowable concentration in parts per million of the isocyanates and amines used in urethane foams?

A. So far as we know, the National Safety Council has no bulletins on this subject. It is generally felt, however, that the maximum allowable concen-

SRG reclaimed rubber panelists *(left to right:)* J. M. Ball, J. E. Brothers, E. B. Busenburg, Moderator E. H. Ruch, J. E. Misner, C. Huddleston, and T. H. Fitzgerald

tration of TDI should be 0.10-part per million. We have no specific information on the amines. Raw material suppliers are usually very cooperative in providing such information.

Q. Have you considered the use of viscosity depressants, and, if so, what type of materials is used?

A. It is doubtful if viscosity depressants would be useful in slab urethane foam work. The viscosity of the prepolymer is critical at the time foaming takes place, and if viscosity is too low, the foam will collapse.

"The Chemistry of Rigid Urethane Foams and Mechanical Foaming Apparatus," by Benjamin Collins, stated that the chemistry of rigid urethane foams is, for the most part, the chemistry of flexible urethane foams; the difference is only in the number of branch points and spacing between and within branch chains of the polyurethane polymer.

The early work in the field of rigid polyurethane foams was done by the Germans during World War II. Their basic process was the now-familiar system of Desmophen (polyester) and Desmodur (diisocyanate) which was used to produce a rigid cellular plastic called Moltopren.

Further research by Goodyear Aircraft Corp. and Lockheed Aircraft Corp. brought to light the fundamental mechanisms involved in rigid polyurethane foam processes and laid a firm basis upon which the current state of development of the process now rests.

The rate of development of mechanical foaming mixers has paralleled the growth of urethane foam consumption in the United States, and now a number of manufacturers can construct a urethane foaming machine to handle practically any type of mass production, Collins said. Machines of this type are, he reported, generally semiautomatic metering, mixing, and dispensing devices.

Typical applications of rigid polyurethane foams include insulation for trailer vans and railway refrigerator cars; radomes; control surfaces of aircraft; structural filler for large void areas of submarines; special packaging problems; and for potting electrical components.

Reclaimed Rubber Panel

"Reclaimed Rubber in Molded Goods and Other Non-Transportation Items?" was the subject of the first talk by John Brothers. A quick off-the-cuff answer to this question is, he said, "minimum cost for a given quality."

Mechanical goods compounders, because of the highly competitive nature of the business and the wide variety of products produced, must be more cost conscious than their colleagues from other segments of the industry.

Although reclaimed rubber contributes in an obvious way toward lowering compound cost by extending a high-cost elastomer with a low-cost hydrocarbon, other more subtle cost reductions may be realized, Brothers reported, through compounding with reclaimed rubber.

The key to the best use of reclaimed rubber is, he explained, to consider reclaimed rubber as a compounding ingredient in its own right and not classify it as a "substitute for any crude polymer." Thus occasions may arise when use of reclaim may slightly increase the material cost of a compound, but it will be used to secure processing advantages or to meet certain specifications.

Some advantages, other than reduction of material cost, of compounding with reclaimed rubber include reduction of mixing time; reduction in the number of warm-up mills needed for efficient tuber operation; use of lower tubing temperatures; higher calender speed; better mold flow; improved hot elongation; and stabilization of curing systems with decreasing tendency to reversion. An additional advantage of reclaimed rubber is (provided sufficient volume is used) the possibility of obtaining a reclaim with unique properties tailored to a specific production problem.

Mr. Brothers answered the following questions after his talk:

Q. Is it possible to develop a compound with reclaimed rubber as the sole elastomer?

A. Specification compounds are made with reclaimed rubber as the sole elastomer. The same compounding techniques are followed as would be with "new" elastomers. The aging properties of both are equivalent provided the same compounding techniques are followed. The main limitation is the end-quality desired.

Some non-curing compounds are in use today that are made entirely of reclaimed rubber and contain no additional compounding ingredients.

Q. Can reclaim be used successfully in products required to meet current military specifications?

A. Yes. We recognize the fact that certain military specifications are completely out of range of reclaimed rubber, but in many others reclaim can be used. The Federal Government has indicated it will endorse domestic elastomeric materials, and reclaim does fall into this category.

Q. How does reclaimed rubber act in rubber-metal adhesions?

A. Metal adhesion can be obtained equally well with or without reclaim. Since it is generally conceded that the strength of a rubber-metal adhesion should be greater than the rupture strength of the rubber compound used, the only limitation due to reclaim is the lowered tensile strength of the rubber-reclaim compound. If we are working in a quality range in which lower tensile strength is acceptable, satisfactory adhesion can be obtained at lower cost with reclaim than without it.

Q. Are whole-tire reclaims compatible with neoprene and nitrile rubbers?

A. Whole-tire reclaims can be used in a compound in conjunction with neoprene or nitrile elastomers. Some lowering of solvent resistance to given oils will be observed, but not necessarily in proportion to the amount of reclaim present. In this connection, special reclaim from nitrile or neoprene compounds is available which can be used without degrading the oil-resistant qualities of the finished compound.

Q. What is the present status of making colored mats by surface coating a black base as opposed to a solid colored stock?

A. Most of the present-day colored automobile mats are manufactured from a black base stock covered by a 0.003-inch film of colored polyvinyl chloride.

Q. Is the ozone resistance of Enjay Butyl 268 improved by the addition of butyl reclaim?

A. No.

"What Is Reclaimed Rubber and How Is It Made?", by J. M. Ball, defined reclaimed rubber as "the product resulting from the treatment of ground vulcanized scrap rubber tires, inner tubes, and miscellaneous waste rubber articles by the application of heat and chemical agents whereby a substantial devulcanization or regeneration of the rubber compound to its original plastic state is effected."

The five major rubber reclaiming processes are, according to this speaker, the digester process; the heater or pan process; the high-pressure (800-1,000 psi.) steam process; the Lancaster-Banbury process; and the Reclaimator process.

Further discussion of this topic may be found in RUBBER WORLD's August 1956, and May, 1957, issues, beginning on pages 730 and 246, respectively.

Mr. Ball then answered the following questions:

Q. Can reclaim be used with SBR to give smooth stocks?

A. Yes. A well-refined reclaim can be used to replace 10-20% of SBR on an equal rubber hydrocarbon basis to give smooth extruded stocks. Whole tire reclaims, mechanical or blend reclaims, or inner tube reclaims may be used. A moderate proportion of a suitable-grade furnace black is desirable for best results.

Q. What is the status of reclaimed rubber in hard rubber products?

A. About 6% of the U. S. reclaim consumption is in hard rubber products. For high-grade hard rubber products (and high-grade hard rubber dust) pure gum natural rubber reclaims or ground natural rubber scrap are used. For intermediate-quality hard rubber products, carcass reclaims are used. Sometimes a mixture of SBR and whole tire reclaim, along with a high loading of filler and oil, is used in hard rubber battery case formulations; frequently, however, SBR is the only binder. Non-staining whole tire reclaims are used to make hard rubber steering wheels.

Q. Can you name any plasticizer that might improve retention of shelf-aged tack of electrical friction tape?

A. Natural rubber inner tube reclaim is the primary plasticizer for this purpose. Other plasticizers, such as rosins of various kinds, have only a secondary effect.

"What Are Premixes, and How Are They Used" was discussed by J. E. Misner. A premix or precompounded reclaim is, according to Misner, a conventional reclaim into which high percentages of compounding ingredients are dispersed through the refining and straining operations. Conventional compounding ingredients such as carbon black, whiting, clay, mineral rubber, plasticizers, tackifying resins, and coloring materials are added during the mixing or blending operation prior to refining.

Premix reclaims are classified or identified by the type of loading, type of reclaim scrap used (whole tire—carcass—natural and butyl inner tube), specific gravity, staining or non-staining action, rubber content, and color, the speaker further declared.

Premix reclaim is, he went on, a truly tailor-made rubber because the compounding ingredients are added in accordance with the requirements of the consumer and can be modified to qualify processing properties and specifications of the end-product. This adaptability of the premix reclaim enables the consumer to obtain unique results with a minimum of development work on his part. Premix reclaims, Misner reported, fit especially well into today's present trend toward automatic mixing equipment. The proper use of premix reclaim can be helpful to the compounder to maintain the kind of quality that will result in expanding sales and lower costs.

Additional material on reclaim premixes is given in RUBBER WORLD, August, 1956, and May, 1957, pages 730 and 246, respectively.

The following questions were answered by Mr. Misner:

Q. How does the consumption of reclaim compare with that of other types of rubber?

A. The consumption of the six major types of rubber totaled 1,462,640 long tons in 1957; while the total consumption of reclaimed rubber, in the same period, was 266,852 long tons.

An approximate breakdown by end-use of reclaimed rubber appears in Table 1.

Q. What is the availability of light-colored reclaims, and where are they used?

A. There is a shortage of suitable light-colored scrap at present; hence high-quality light-colored reclaims are in short supply. Light-colored reclaims are used in cements, tapes, dispersions, stair treads, mats, heels, soles, light-colored mechanical goods and general rubber replacement applications.

Q. If butyl tires are made in volume, is there any real danger they will become mixed with other tire scrap and tend to degrade the quality of whole-tire reclaim?

A. Results of development work to date show that butyl tires can be processed into a high-quality reclaim if processed separately and are free from contamination by mixed synthetic and natural rubber tire scrap.

In case the butyl scrap tires are used on a run-of-mine basis with mixed SBR and rubber scrap tires, and if the percentage of butyl tires in any one shipment does not exceed 5%, we do not anticipate any change in the quality of whole-tire reclaim.

"How Reclaimed Rubber Is Used in Tires and Other Transportation Items" was described by E. B. Busenburg. Most first-line tires, according to Busenburg, contain reclaimed rubber in one or more component parts of the tire. The parts where reclaimed rubber has potential use are the carcass, undertread and sidewall, treads, bead wire insulation, on the tubeless tire liner. In addition, reclaimed rubber is used in inner tubes (particularly butyl inner tubes).

By proper use of reclaimed rubber,

TABLE 1. CONSUMPTION OF RECLAIMED RUBBER

End-Use	Reclaim Used (As % of Total Reclaim Consumption)
Tires and tire products	55
Mechanical goods (automotive, military, and auto floor mats)	19
Hose, belting, and packing materials	7
Battery cases and covers and steering wheels	6
Household and plumbing products, cements, dispersions, toys, soles and heels, etc.	13
	100

TABLE 2. USE OF RECLAIMED RUBBER IN TIRES

Compound	Parts of New Polymer	Parts of Reclaimed Polymer	Type of Reclaim
Carcass	75	25	First-quality neutral process tire
Sidewall and undertread	75	25*	Whole-tire or peel
Treads	100	None for first-line or premium tires	
	—	Varying amounts for second- and third-line tires, farm service tires, and camelback	Whole tire
Tubeless tire liner	50†	91	Butyl
Bead wire insulation	60‡	40	Modified whole tire
Butyl inner tubes	70	30	Butyl

* Special non-staining reclaim used for whitewalls.
† A blend of smoked sheets and SBR.
‡ 30 parts smoked sheets and 30 parts SBR.

the speaker said, it is possible to give the customer more miles per dollar and at the same time maintain a high level of quality, performance, and safety necessary in today's tires.

The more competitive second- and third-line tires usually contain larger quantities of reclaimed rubber and still give good overall performance, Busenburg added.

The reason for reclaimed rubber is, of course, costs—materials costs and processing costs. If a compound utilizing reclaimed rubber can be developed to meet all test and service requirements, then a direct materials cost saving can usually be made. Above and beyond this are advantages and savings in cost of preparatory work on the rubber and processing of the tire components. Whole-tire reclaim, as received at the tire factory, is a rubber which breaks down rapidly to a good processing consistency with comparatively low power consumption. It is a material ready to use in Banbury mixes without need of preparatory work. In the case of new polymers, the story is entirely different.

Typical present-day recipes for use of reclaimed rubber in component tire parts are abstracted from the "Manual of Reclaimed Rubber," published by the Rubber Reclaimers Association, and are presented in Table 2.

Q. The recently issued "Manual of Reclaimed Rubber" points out certain factors concerning the rate of cure of reclaim. Can you amplify this with respect to its comparison with natural and synthetic rubber?

A. Most present-day reclaim is characterized as neutral-process reclaim to differentiate it from the so-called alkali process in wide use when natural rubber was the only polymer to be treated.

The alkali-process natural rubber reclaims were faster in cure rate than natural rubber and, of course, much faster than SBR.

The Manual has an excellent table illustrating the effect of varying a blend of oil-extended SBR and neutral-process whole tire reclaim. The accelerator proportion is lowered progressively as reclaim is introduced or increased. Cure rate is maintained.

If a compounder wants to reduce his time or lower his temperature, he can maintain accelerator ratio, as reclaim is introduced.

If he wants to retain present curing conditions, he *must* reduce accelerator.

Q. How does reclaimed rubber affect heat and oxygen aging?

A. Reclaimed rubber is a good aging material. In general, compounds containing reclaimed rubber show good retention of properties in oxygen bomb or oven aging at normal temperatures and meet specifications in this regard.

Other factors, such as choice and percentage of accelerators and antioxidants, have more important effects on severe aging and oxygen tests. The merits of the use of reclaim or, rather, the selected combination of materials must be carefully evaluated under specific conditions.

Use of antioxidants can be minimized in high reclaim stocks. For some end-product uses no antioxidant is used. When the compound must meet severe artificial aging tests or service conditions, added antioxidants produce substantial benefits.

Q. What is the outlook for the continued supply of scrap for butyl reclaim during the next few years?

A. The outlook is good, and supplies of butyl scrap appear adequate for present uses.

This situation could be complicated by growth of the butyl tire business. Manufacturers of experimental butyl tires are generally not marking them for identification and segregation. Tire manufacturers have indicated recognition of the importance of adequate marking if sizable production develops so that needed butyl reclaim for use in tires will be available.

Q. How can an unmarked butyl tire be quickly identified, for example, in a retread plant?

A. This identification is not easy. The tire would have to become suspect by reason of softer feel. The Shore A hardness of treads on butyl tires I have seen is 50-52, as compared to approximately 60 on conventional tires. This difference is difficult to detect by a "pencil" probing test for softness and rebound. Also, this hardness difference could be eliminated by compounders at any time in the future.

A technician can ignite a cut sliver, extinguish it, and make an identification by odor or smear of the burned area on paper. Butyl tire compounds give a soft black, smeary burned surface. High SBR compounds commonly used in passenger tire treads give a dry brittle ash with little tendency to smear. A detector paper which changes color when exposed to butyl smoke might be a possibility.

The Enjay people tell me that a number of butyl tires have been recapped with conventional retread material in commercial retreading operations with good success. For this reason there may be no great need for detection.

"What Types of Reclaim Rubber Are Available" was the subject of the talk by T. H. Fitzgerald. There are two basic factors, he stated, which determine to a great extent the types of reclaim polymers commercially available. First, and certainly the most important factor, is the source of scrap from which the reclaim is made, and, second, is the reclaiming process itself.

The most important source of scrap rubber is tires. This is true because the supply is plentiful; the cost is low; the quality of rubber in tires is high; and, broadly speaking, the scrap is of a very uniform quality. This last statement, Fitzgerald noted, may be a little surprising in view of the big difference in third-line and premium-tire formulations. In practical reclaim operations, however, these differences tend to average themselves out."

The field of tire reclaims may be further broken down into whole tire (the most important volume-wise), tread peelings, and carcass reclaims. Tire reclaims are frequently modified, Fitzgerald went on, to develop certain desirable properties or meet some specific specification. For example, it is generally accepted that inclusion of a small percentage of scrap less "nervy" than tire scrap, and possibly addition of inorganic fillers, will provide a reclaim that will extrude or calender much more smoothly than a straight whole-tire reclaim. These reclaims, tailored to yield unique properties, are known broadly as "modified tire reclaims."

To complicate the picture further, the reclaiming process itself must now be considered (see talk by J. M. Ball). The most widely used reclaiming process is the digester process because it not only produces a high-quality reclaim, but causes chemical disintegration of the tire cord at the same time the rubber is being plasticized. A process is available, however, for mechanically separating fiber from rubber, thus permitting other reclaiming processes such as the pan, the Reclaimator, or the Lancaster-Banbury process to be used.

The second largest single source of scrap is inner tubes. Most inner-tube scrap is butyl for reuse in butyl tubes. There is, however, still a surprising amount of natural rubber inner-tube scrap on the market. Since inner tubes are free of fiber, they lend themselves to any type of reclaiming process.

The third major classification of scrap is known in the trade as mechanical scrap and includes scrap from such items as regular and cellular soles, heels, factory scrap, automobile floor mats, rubber matting in general, and tire curing bags.

The above accounts for the major sources of scrap rubber. In addition there is available in small, yet important quantity, other scraps such as rubber thread, pure gum nipples, girdles, and toys, all of which produce distinctive types of reclaimed rubber.

Besides reclaims produced from all types of general-purpose polymers, reclaims are now available from the specialty polymers such as neoprene, nitrile, butyl, and silicone.

The questions answered by Mr. Fitzgerald follow:

Q. Can reclaimed rubber be successfully used with oil-extended SBR?

A. Most certainly.

Q. How are reclaims made non-staining?

A. Stain comes mainly from antioxidant in the tire, plasticizers used

in the tire stocks, and plasticizing oils used in reclaiming processes. Therefore to produce a non-staining reclaim one minimizes as far as possible these three sources of stain.

Whitewall tires are a good example of scrap having minimum initial stain.

Next, the reclaimer must select oils strictly non-staining; and, last, activated carbon is added during the milling operation to absorb the staining ingredients.

Q. How does the addition of reclaimed rubber improve asphaltic products?

A. Reclaimed rubber gives better flexibility at low temperatures, less tendency to flow at high temperatures, better adhesion to concrete, and improved aging.

"What Are the Major Reasons for Using Reclaimed Rubber?" was discussed by C. Huddleston. Reclaimed rubber, he emphasized, is a unique and useful raw material for the rubber industry and does not have to lean on other elastomers for support. As a partially compounded rubber, it is recognized not only as a source of elastomer, but also for the organic and inorganic filler content. When reclaimed rubber is added to a massing machine of any type, it plasticizes almost at once, using less power and generating less heat than virgin polymers. Reclaimed rubber, therefore, should be considered as an elastomer on which work has already been done at no extra cost to the user.

Reclaimed rubber is useful in making processing conditions more tractable, to reduce shrinkage, to stabilize rate of cure in difficult compounding situations, and to impart good aging properties to a compound.

Last, but not least, reclaimed rubber is used to reduce direct material costs (while maintaining specification quality) and processing costs.

Mr. Huddleston then answered the following questions:

Q. Can reclaimed rubber be used in camelback, and, if so, what advantages are obtained?

A. Five to 10% of the rubber hydrocarbon of even premium camelbacks may be replaced by reclaimed rubber without reducing its quality. The camelback producer will have a cooler and faster mixing compound with a fast non-scorching warm-up, and more pounds per hour from his extruder. The user will have a faster and more uniform curing camelback with improved cold flow and better shelf-life.

Q. What are the advantages of using reclaim in solvent cements and pressure-sensitive tapes?

A. Reclaim imparts a cohesive and adhesive nature to tape which cannot be obtained from plasticized rubber. High gum reclaim rubbers are used in making pressure-sensitive tapes.

Q. How can reclaim be used in sponge rubber?

A. The addition of 10% (on the batch) of reclaimed rubber, even to the softer sponge formulations, reduces the uncured "nerve" and evens out variations in both blowing and curing. In closed-cell sponge a much larger amount of reclaimed rubber can be used, giving the same advantages. The use of a non-staining reclaim of low plasticity is entirely satisfactory in non-staining sponge formulations.

Q. How has the reclaimed rubber industry met the challenge of the new specialty elastomers?

A. Reclaims have been made from the silicones, fluorosilicones, Viton A (but not Viton AHV), and Kel F. The reclaiming industry is making every effort to keep pace with new polymer developments.

CRG Golf Tourney

The largest and most successful golf outing of the Chicago Rubber Group was held on July 25 at the Medinah Country Club, Medinah, Ill., with more than 380 guests and members in attendance, 270 of whom played golf. A record list of valuable door prizes, totaling more than $4,000 in retail value, was distributed to members and guests. Three portable TV sets were raffled off in a special feature of the day.

The committee members wish to thank the more than 150 rubber manufacturers and raw material suppliers whose contributions made the prizes possible. The committee members were: Ed Wagner, Witco Chemical Co., chairman; Ralph Schell, Bauer & Black Division, Kendall Co., assistant chairman; Harold Shetler, Sirvene Division, Chicago Rawhide Mfg. Co.; Paul Chalex, The Richardson Co.; Roland Doran, Silicone Division of Union Carbide; Ed Lucas, Velsicol Chemical Corp.; Wm Lussie, R. T. Vanderbilt Co.; Al Marr, Judson Rubber Co.; Yale Karmell and Russ Spielman, Witco; Dwight Smith, The Cary Co.; Frank Smith, Williams-Bowman Rubber Co.; and Harold Stark, Dryden Rubber Division of Sheller Mfg. Co.

Some of the golf winners follow: *low gross (members)*, Milt Leonard, Columbian Carbon Co.; J. A. Edmond, Central Rubber Co.; and L. Lukity, Dryden Rubber; *low gross (guests)*, R. Geils and J. Warner; *long drive (members)*, Al Laurence, Phillips Chemical Co. and John Porter, H. Muehlstein & Co., Inc.; *long drive (guests)*, N. D. Whipple and Dick Fick; *nearest to pin (members)*, Bill Cary, Cary Co., and Jim Finzer, National Rubber Roller Co.; *nearest to pin (guests)*, D. E. Anderson, Continental Diamond Fiber Co., and C. Catalana, Salisbury Rubber Co.

Also, high gross (members), Al Cobbe, Godfrey L. Cabot, Inc.; and *most putts (members)*, Bud Sparhawk, Sparhawk Co.; *putting on practice green, tie*, A. W. Schoeler, Armstrong Rubber Co. and E. Hibbs, Rapid Roller Co.; *putting on course (members)*, tie, B. W. Hubbard, Ideal Roller & Mfg. Co., and J. Leeds, Leeds Rubber Co.; *(guests)*, L. Keyes, Dayton Rubber Co.

The Peoria handicap winners (*members*), first three places, were J. Toman, Victor Gasket & Mfg. Co., F. Smith, Williams-Bowman, and C. Oshinski, United States Rubber Co.; (*guests*), D. E. Anderson and G. Sharkey. Blind bogey winners included Jack Aller, J. M. Huber Corp.; M. O'Dell; and J. Braden, Dryden Rubber.

Safety Congress Due

The effect of the problem drinker in an industrial safety program will be one of the topics at the session of the Rubber Section of the National Safety Council at its forty-sixth annual convention, the National Safety Congress. This will be held in Chicago, Ill., October 20-24, with headquarters at the Conrad Hilton Hotel.

J. E. Laughlin, plant protection manager, Firestone Tire & Rubber Co., will conduct a discussion of the problem drinker in industry. How safety can be manufactured into rubber-making equipment will be discussed by these speakers: L. E. Soderquist, vice president and director of engineering, McNeil Machine & Engineering Co., Akron, O.; A. S. MacLeod, engineering department, United States Rubber Co., New York, N. Y.; and Everett Perlberg, technical representative, Adamson United Co., Akron.

The 300 Congress sessions and 900 speakers will attract an expected 12,500 safety specialists from the United States, Canada, and several foreign countries. To obtain a complete preliminary program, write to Jack Horner, director of news, National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.

Cable Symposium

The seventh annual Wire and Cable Symposium sponsored jointly by the U. S. Army Signal Research & Development Laboratory and industry will be held at the Berkeley-Carteret Hotel, Asbury Park, N. J., December 2-4.

Some 25 papers showing the technical progress during the past year in the field of communication wires and cables will be presented during the three-day session.

The symposium committee is again headed by Howard L. Kitts, as chairman, with H. F. X. Kingsley, as co-chairman.

SAE Hears Robertson Discuss Truck Tires

At the national West Coast meeting of the Society of Automotive Engineers, Inc., held at the Ambassador Hotel, Los Angeles, Calif., August 11-14, T. A. Robertson, of The Firestone Tire & Rubber Co., Akron, O., spoke on "Tires for Tomorrow's Truck." A summary of his talk follows.

Tomorrow's truck tire must be designed with a construction to minimize heat generation and with materials which will maintain their strength and withstand operating at elevated temperatures. The increased vehicle acceleration and engine horsepower will make it necessary to provide maximum traction and skid resistance to the tire tread design, and at the same time, consideration will have to be given to maintaining a minimum noise level and providing a soft, comfortable ride. In keeping with the emphasis of maximum payloads, tires will be required to have the maximum possible capacity in relation to their size with a trend toward reduced overall diameter to take up less useful space in the vehicle design. Increased emphasis will also be placed on continuing to reduce the weight of tires and rims.

It is probable that in developing the high-speed truck tires of the future, engineers will go part way in the direction of the thinner racing construction. In doing this, they will have to make up in some way for the reduced volume of material used in order to maintain overall durability. There are two possibilities for accomplishing this objective.

One way of providing economical operation with a thin tread on the tire would be by additional use of retreading. Even today many truck operators are finding that an efficient retreading program provides the ultimate in low cost per mile operation. It is conceivable that retreading practices can be developed—so that a new tread can be put on a tire without removing it from the rim or even without dismounting it from the vehicle.

In the tire of the future tire manufacturers visualize a synthetic tread with greatly improved abrasion and cracking resistance. The rubber for the body will be specially designed to provide low running temperature and maximum adhesion and to resist separation and aging. Another special synthetic rubber or plastic will be used in the tubeless innerliner to provide complete impermeability to the passage of air plus plasticity to seal punctures. With chemically made rubbers manufacturers should eventually be able to make a chemically perfect tire and no longer be restricted by limitations of the natural product.

Until 1957 the steelcord tire was a very specialized item because of its heavy weight and the requirement for operating at higher inflation pressures than fabric tires. Last year a new construction was introduced which was comparable in weight to a fabric tire and which could be operated at the same inflation pressure. This expanded the application of steelcord tires to regular over-the-highway trucks, and a bright future is foreseen owing to the advantages inherent in the steelcord construction.

Going a step further, manufacturers are now making a unique-construction steelcord tire which shows promise of further improving treadwear performance and providing a softer ride. In this new construction the body is composed of a single ply of wire running straight across the tire from bead to bead instead of at the criss-cross angle normal in a conventional tire. Stability is obtained through a layer of steel tread plies running at a very high angle in the crown on the tire.

The high-angle tread plies produce in effect an inextensible flexible steel band running circumferentially around the tire. The band's inextensibility provides improved treadwear since it practically eliminates scuffing of the tread as the tire rotates through its contact with the road.

One way of obtaining an increased capacity-to-size ratio is the high-load truck tire. In this construction the load-carrying ability of the tire is increased by going to higher inflation pressures with a higher number of plies. Tires of this type—in both nylon and steelcord construction—are in use today. They carry the loads successfully; however, there is room for improvement in ride characteristics and overall mileage potential compared to the larger lower-pressure regular tires which they replace.

Finally, what are the prospects for obtaining the lighter weight, economy of operation and maintenance, and the simplicity of design and servicing which will be increasingly important for the tires of tomorrow? Certainly improved materials and constructions will play an important part in achieving these goals. In addition, from a basic design standpoint, the tubeless truck tire with its one-piece drop-center rim will play a vital part in meeting the requirements of the future.

Symposium on Plastics

Plans are nearing completion for an International Symposium on Plastics Testing and Standardization to be held immediately following the fall meetings of ASTM Committee D-20 on Plastics at the Benjamin Franklin Hotel, Philadelphia, Pa. The program comprises four sessions to be held on October 30-31.

The symposium is being sponsored by ASTM on behalf of the American Group for the International Organization for Standardization (ISO) Technical Committee on Plastics. The proceedings will be published by ASTM. The symposium will be followed by the eighth plenary meeting of the ISO/TC 61 on Plastics to be held in Washington, D. C., November 3-8. Plans for the Philadelphia symposium and the Washington meeting are being coordinated by C. H. Adams, Monsanto Chemical Co., chairman of the American Group. Many special events are being arranged for the delegates from abroad, of which 50 or more are expected.

A technical program for the international symposium is available from the American Society for Testing Materials, 1916 Race St., Philadelphia, Pa.

Temple Offers Course

Temple University Management Institute's evening school, Philadelphia, Pa., again is offering a course in rubber technology to be held on consecutive Tuesdays from 7:30 to 9:30 p.m., beginning September 23 and ending December 9.

The instructor, A. L. Back, A. L. Back & Associates, has considerable experience in teaching and is a specialist in the field of rubber technology. A consulting chemical engineer and chemist, he is also a licensed professional engineer.

The content of the course will include: introduction, terminology, and history; natural rubber; diene-type synthetic rubber; other types of synthetic rubber; latex; reclaimed rubber; processing; vulcanization; aging and degradation; reinforcement; softeners and peptizing agents; extenders and other compounding ingredients; and physical testing.

For registration or further information, write Temple University Management Institute, Cheltenham Ave. & Sedgewick St., Philadelphia 50, Pa.

NYRG Enjoys Golf

The Winged Foot Golf Club, Mamaroneck, N. Y., was the scene of the New York Rubber Group's golf tournament held August 5. The sky was cloudless, temperature mild, the course inviting; and members and their guests responded to the occasion with an attendance of about 255.

Jim Wernersbach, shooting a low gross 74, was the winner of the Nesbit Golf Cup. A guest of the Group, W. Fenwick, was honored for his professional-like 73.

Competition was keen for high gross score prizes, with R. Mineo (member) and T. Math (guest) winners.

Fifty-two persons were two golf balls to the good as a result of awards for birdies; Wes Curtis was high man with five birdies for the day's event.

The kicker's handicap resulted in 14 men receiving three golf balls each. J. McVay, with a score of 87 (handicap 8), was the leading contender.

Best putting for nine holes resulted in a tie between Wernersbach and Mike Sevento; the award was decided by chance, with Sevento winning the toss.

The day's outing was concluded with a dinner and awarding door prizes.

ORG/CIC Offer Course

The Ontario Rubber Group in conjunction with the Rubber Division of the Chemical Institute of Canada has announced a course in rubber technology to be presented through the extension department of the University of Toronto beginning October 8. The two-semester course, consisting of 10 lectures for each semester, will be held on Wednesday evenings at the university. Each lecture is of two-hour duration. The expected fee, \$25-\$30 per person, will include the publication of the lectures.

The lectures and announced lecturers are as follows: *First semester:* 1. "Introductory Talk," N. S. Grace, Dunlop Canada, Ltd., and "History of Rubber Industry," J. W. Symons, Dominion Rubber Co., Ltd.; 2. "Natural Rubber"; 3. "Polymerization," I. H. Spinner, University of Toronto; 4. "Synthetics (SBR Type)," E. E. Gale, Polymer Corp., Ltd.; 5. "Synthetics (Butyl, Nitrile)," H. Pfisterer, Polymer Corp.; 6. "Neoprene, Hypalon, Polyurethane Elastomer," E. I. du Pont de Nemours & Co., Inc.; 7. "Reclaim," A. Beauchamp, "Thiokol," Naugatuck Chemicals; and "Silicone," D. Miller, Dow Corning Corp.; 8. "Antioxidants, Antiozonants, Waxes, Etc.," C. R. Howey, Naugatuck Chemicals; 9. "Carbon Black," J. W. Snyder, Columbia Carbon Corp.; and 10. "Non-Black Reinforcement," R. Wolf, Columbia-Southern Chemical Corp.

Second semester (beginning January 14, 1959): 11. "Vulcanization (Accelerators)," G. C. Maassen, R. T. Vanderbilt Co.; 12. "Latices and Foam Rubber," T. H. Rogers, The Goodyear Tire & Rubber Co.; 13. "Testing Methods and Equipment," H. Deline, Dunlop Canada; 14. "Art and Science of Compounding," B. S. Garvey, Pennsalt Chemical Corp.; 15. "Textiles and Fibers (Rayon, Nylon, Cotton)," J. Benns, Dominion Textile, Ltd.; 16. "Production Machinery (Mixing Machines — Calenders)," E. Dyer, Dominion Engineering; 17. "Production Machinery (Curing Equipment, Extrusion Equipment)," V. Hovey, John Royle & Sons; 18. "Products—Tires," M. Morgan, B. F. Goodrich, Canada, Ltd., and "Products—Footwear," W. H. Bechtel, Kaufman Rubber (Ontario), Ltd.; 19. "Products—Industrial Rubber Products," E. D. Jackson, General Tire & Rubber Co. of Canada, Ltd., and "Products—Wire & Cable," E. H. Swartz, Southern Clays, Inc.; and 20. "Future Materials and Processes," E. M. Immergut, Dunlop Canada.

This same course will be presented in Montreal through McGill University on the Thursday following the lecture in Toronto. Further information can be obtained from C. M. Croakman, Columbian Carbon (Canada) Ltd., 7 Superior Ave., Mimico, Ont., Canada.

CALENDAR of COMING EVENTS

September 25
Fort Wayne Rubber & Plastics Group. Van Orman Hotel, Fort Wayne, Ind.

October 3
Detroit Rubber & Plastics Group, Inc. Detroit-Leland Hotel, Detroit, Mich.
Chicago Rubber Group.

October 7
The Los Angeles Rubber Group, Inc. Biltmore Hotel, Los Angeles, Calif.

October 9
Northern California Rubber Group.
Southern Ohio Rubber Group.

October 14
Buffalo Rubber Group. Hotel Westbrook, Buffalo, N. Y.

October 17
New York Rubber Group. Henry Hudson Hotel, New York, N. Y.
Boston Rubber Group. Hotel Somerset, Boston, Mass.

October 17-18
Southern Rubber Group. Roosevelt Hotel, New Orleans, La.

October 20-24
National Safety Council. Forty-Sixth National Safety Congress. Conrad Hilton Hotel, Chicago, Ill.

October 20-21
Instrument Society of America. National Rubber & Plastics Instrumentation Symposium. Akron, O.

October 21
Elastomer & Plastics Group, Northeastern Section, ACS. Annual Meeting. Science Park, Charles River Dam, Boston, Mass.

October 24
Philadelphia Rubber Group. Poor Richard Club, Philadelphia, Pa.
Akron Rubber Group. Sheraton-Mayflower Hotel, Akron, O.

October 28
Assn. of Consulting Chemists & Chemical Engineers, Inc. Thirtieth Annual Meeting: Symposium, "What's New in Chemistry." Biltmore Hotel, New York, N. Y.

October 30-31
International Symposium on Plastics Testing & Standardization. Benjamin Franklin Hotel, Philadelphia, Pa.

November 3-8
ISO/TC 61 on Plastics. Eighth Plenary Meeting. Washington, D. C.

November 4
The Los Angeles Rubber Group, Inc. Biltmore Hotel, Los Angeles, Calif.

November 6
Rhode Island Rubber Club.

November 13
Northern California Rubber Group.

November 14
Connecticut Rubber Group. Manero's Restaurant, Orange, Conn.
Chicago Rubber Group.

November 17-21
Eighth National Plastics Exposition. Society of the Plastics Industry. International Amphitheatre, Chicago, Ill.
National Plastics Conference. Hotel Morrison, Chicago.

November 21
Philadelphia Rubber Group. Dance. Manufacturer's Golf & Country Club, Oreland, Pa.

November 30-December 5
American Society of Mechanical Engineers. Annual Meeting. New York, N. Y.

December 2
Buffalo Rubber Group. Christmas Party.

December 2-4
Seventh Annual Wire & Cable Symposium. U. S. Army Signal Research & Development Laboratory, and Industry. Berkeley-Carteret Hotel, Asbury Park, N. J.

December 4
Fort Wayne Rubber & Plastics Group. Van Orman Hotel, Fort Wayne, Ind.

December 5
Detroit Rubber & Plastics Group, Inc. Christmas Party. Statler-Hilton Hotel, Detroit, Mich.

WASHINGTON REPORT

By JOHN F. KING

Justice Reports on Synthetic Rubber In 1957; Decries Static SBR Prices

After another annual inspection by the Justice Department to see if competition is evolving satisfactorily in the synthetic rubber industry, the manufacturers again came out with a clean bill of health. Market developments in 1957 demonstrate "on balance," Attorney General William P. Rogers reported in August, "some progress toward a free, competitive synthetic rubber industry."

SBR Price Uniformity Scored

The government's chief anti-monopoly officer, however, betrayed a degree of impatience with the "almost complete lack of price competition" among producers of synthetic rubber and its component raw materials.

"There seems little excuse," he said, "for continuing the price uniformity born of Government ownership, into a period of a buyers' market and in the face of a recognized decline in the price of natural rubber."

"True," he conceded in the 58-page third report on industry competition since the government sold the synthetic rubber producing facilities to private industry in 1955, "there has been some competition in the furnishing of technical services, in quality and in other factors. . .

"But there can be no fully effective competition as long as this lack of price rivalry continues," Rogers said in his findings. He prefaced his opinion by saying it was not an attempt to determine if there are existing or potential violations of the anti-trust laws. Such transgressions, he said, "should be handled through normal litigation channels."

Besides his dissatisfaction with price rigidities Rogers also expressed disappointment because he saw "no perceptible improvement in West Coast conditions," where Shell Oil Co. enjoys a near-monopoly situation in the production and supply of SBR rubber. A mitigating factor in this situation, however, was that smaller West Coast fabricators, "the ultimate beneficiaries" of increased competition in production and supply, reported "satisfactory" treatment from Shell, Rogers added.

Buyers' Market Effects

On the overall picture of competition within the industry in 1957, the Attorney General noted as the two chief developments the recession-borne transition from a sellers' to a buyers' market and the entry during the year of new producers in the industry.

The emergence of a buyers' market, he declared, "was a product of the considerable expansion of the industry, particularly in the (SBR) rubber and butadiene segments. The resulting increased production considerably outstripped the current demand, leading to customer competition among producers to dispose of accumulated stocks.

"This increased competition," Rogers continued, "is indicated in the improvement and extension of technical services, the introduction of freight allowances or equalization, the improvement of existing grades, and the addition of new grades of synthetic rubbers.

"I have noted more vigorous rivalry for customers in 1957 than at any time since the transfer of the industry to private ownership," he said, adding that "the comments of the small fabricators in this respect are most encouraging."

New Plants

The Attorney General then recounted the entry of new producers into the industry during the year. He said the new facilities that went on stream early in the year "appear to have introduced new competitive elements by engrossing respectable shares of the market from existing producers." Here he referred to the butadiene facilities of Texas Butadiene & Chemical Co. at Channelview, Tex., and Cosden Petroleum Co., which opened a styrene plant at Big Springs, Tex.

Other facilities which came into production later in the year, such as Firestone Tire & Rubber's butadiene plant in Orange, Tex., and General Tire & Rubber's Odessa, Tex., SBR plant, represent a "competitive potential," Rogers stated. He added he could not, however, estimate just how much of a competitive change the later arrivals would bring to the industry as a whole since figures on their operations would not influence overall industry statistics for the year.

The Attorney General also expressed gratification at the possibility that two producers in fields other than the synthetic industry — International Latex Corp. and the Dewey & Almy Chemical Division of W. R. Grace & Co.— engaged in operations during 1957 which may have a competitive effect on the synthetic rubber industry as a whole. International Latex, he said, began operating during 1957 an SBR and nitrile rubber complex, and some of its output reached the open market late in the year. Rogers said he expected more of this volume to reach the open market in the years ahead, although International Latex's plant is intended to produce for the company's own fabricating operations. The Dewey & Almy SBR latex operation might also have an impact in the industry, Rogers suggested.

As significant as the number of new plants to begin operations during 1957, the Report said, was the ease of entry for the new producers.

"No patent, technological or other barriers appeared to have impeded their efforts to gain a place in the industry," Rogers explained.

Roger vs. Brownell Reports

Generally speaking, the Rogers report paralleled that of his predecessor, Herbert Brownell, who as Attorney General last year gave the industry a competitive clean bill of health for its 1956 operations. That was the first full year of private ownership of the industry on which the government could base a competition study. The bulk of the government-owned facilities were turned over to private operators in May, 1955, and the first report of the Attorney General, also prepared by Brownell, covered only the first eight months of that year.

In his second report, covering 1956 industry developments, Brownell found, as did Rogers this year, that while there are "some factors of concern . . . on balance I believe that the 1956 developments in this industry on the whole reflect a favorable progress toward the ultimate goal of the Disposal Act" of 1953. That law enjoins the Justice Department to see to it that the indusry evolves as a "free and competitive" entity. As part of the

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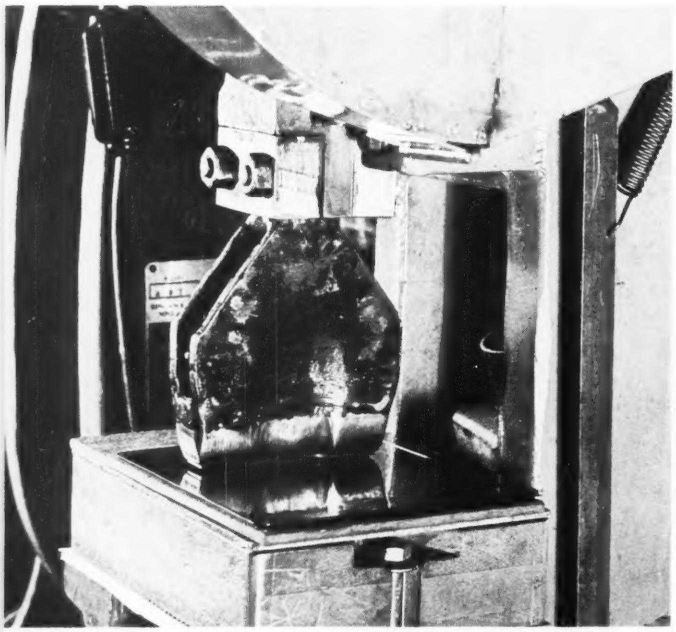
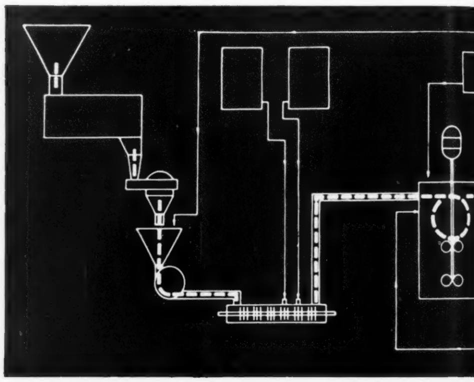




injunction, the Attorney General is required to analyze the growth of competition in the industry from 1955 until 1965, an overall study of one decade in 10 installments.

Market Position SBR Producers

Apart from new developments during 1957, Attorney General Rogers took a look at the changes in shares of the synthetic market held by the original, constituent companies of the new industry which came to life when the government sold out to private ownership.

Goodyear Tire & Rubber Co., he said, was far and away the biggest single component of the industry, having recouped its first-place position temporarily preempted by Goodrich-Gulf in 1956 by virtue of the latter's acquisition of the Institute, W. Va., facility. Goodyear's leading share of 18.4% of SBR capacity at the end of 1957 was "significantly less" than the 21.1% held by 1956's leader, Goodrich-Gulf. Rogers said, however, "I am aware of no factors other than competition to account for this strengthening of Goodyear's position" while the share of the other two of the synthetic "Big Three" — Goodrich-Gulf and Firestone —remained fairly constant at 16.6 and 16.7%, respectively. (See Table 1.)

The Attorney General indicated concern that the three leading producers increased their collective share of the 1957 market, but added that "in the present buyers' market their 9.2% increase in production does not appear to be as significant as the fact that their share of production actually sold increased by only 1.1% since 1955." Also tempering his concern, he said, is the fact the smaller firms in the industry appear to have strengthened their positions "slightly."

Feed Stocks, Specialty Synthetics

Looking at the feedstock segment of the industry, Rogers said that overexpansion in butadiene capacity led in 1957 to increased competitive efforts by the producers, some easing of price and contract terms for both butadiene and styrene, and a situation where independent elements in the industry "appear to be more than holding their own." He added: "The gradual development of markets for butadiene other than the synthetic rubber industry raises the hope that its producers, like those in styrene, may achieve a moderate degree of independence from that industry."

In the field of specialty synthetics, Rogers reported that neoprene "may be gaining ground very slightly" at the expense of butyl. He was disappointed, he said, that Standard Oil's butyl plant scheduled to be built at Lake Charles, La., has been delayed, but added that when this facility is in operation it should, in conjunction with United States Rubber's new-type butyl, increase the competitive potential of this segment of the industry.

Small Business Problem

As a final item in his findings and opinions, Rogers examined small business and how it fared in the industry last year. Based on a survey of 100 "small" synthetic fabricators, the Attorney General said the supply and price treatment they received from the producers was "satisfactory." He implied the chief reason for this was the 1957 transition to a buyers' market.

TABLE 1. MARKET POSITION OF SBR PRODUCERS, 1955-57

Company*	% of Capacity May 1, 1955 (*Rev.*)	% of Capacity Dec. 31, 1956	% of Capacity Dec. 31, 1957	% of Production 1955	% of Production 1956	% of Production 1957	% of domestic sales† 1955	% of domestic sales† 1956	% of domestic sales† 1957
Goodyear (1)	18.3	14.6	18.4	17.7	18.4	24.2	23.0	16.6	23.1
Firestone (3)	16.2	17.3	16.6	19.1	20.6	20.6	19.9	18.1	19.1
Goodrich-Gulf (2)	11.9	21.1	16.7	12.7	12.9	13.9	10.3	11.5	12.1
Shell (5)	11.7	11.5	9.1	10.2	9.6	7.7	10.6	10.0	8.5
Texas-U. S. (4)	11.0	11.6	9.2	12.0	12.8	7.0	10.4	12.5	9.2
Phillips (6)	8.7	6.5	8.0	7.1	6.9	8.3	8.0	9.7	8.3
United Rubber (8)	‡7.8	5.6	5.0	3.7	4.9	4.4	5.0	7.6	6.2
Copolymer (7)	6.1	5.5	5.4	6.4	6.8	7.1	5.6	6.8	7.2
A. S. R. C. (9)	5.5	4.0	4.9	6.6	4.4	4.0	5.3	4.5	3.7
U. S. Rubber (11)	2.8	2.3	2.2	2.6	2.7	2.4	1.9	2.7	2.5
General (10)§	...	...	2.9	...	...	0.3	...	...	0.1
All others¶	...	...	1.6	‖1.9	...	0.1	...	...	(**)
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

**Less than 0.1 of 1%.
†Includes intra-company transfers.
*Companies are listed in order of relative size at the time of transfer to private ownership; ( ) following company name identifies the rank in order of 1957 S-type capacity.
‡Capacity on July 15, 1955, when plant was transferred to United Rubber & Chemical Co.
§Since General was in production only at the end of 1957, its percentages are unrepresentative of its operations on an annual basis.
¶Includes Dewey & Almy Chemical Division, W. R. Grace & Co., and International Latex Corp.
‖Government production at Baytown, Texas plant, May 1 to July 15, 1955.
Source: 1955 and 1956 data from **Second Report**, p. 9; 1957 data based on information furnished to the Department by the producers.

TABLE 2. NUMBER OF COMPANIES SUPPLIED BY MANUFACTURERS AND JOBBERS, 1957

Supplier	Number Of Fabricators Supplied: SBR	Butyl	Neoprene	Nitrile
A. Schulman*	12	..	..	..
A. S. R. C.	14	..	..	..
Copolymer	8	..	..	..
Du Pont	..	..	58	..
Enjay	..	27	..	..
Firestone	21	..	..	1
General Latex*	1	..	..	..
Goodrich	5	..	..	40
Goodrich-Gulf	15	..	..	1
Goodyear	26	..	1	8
H. A. Astlett*	1	..	..	..
Muehlstein*	7	1	..	2
Phillips	46	1	..	..
Polsom*	1	..	..	..
Polymer	3	1	..	..
Shell	11	..	..	..
Texas-U. S.	14	..	..	..
Thiokol	..	5	..	..
United Carbon	5	1	..	..
United Rubber	11	..	..	..
U. S. Rubber	8	..	..	14
Xylos†	..	..	..	3

*Jobbers.
†A marketing division of Firestone.
NOTE: These tables are not entirely reflective of the survey fabricators. A few companies did not give the names of their suppliers.

An indication of the degree of activity of various synthetic rubber producers in supplying small business was indicated in Table 2, taken from the Third Report. It identifies all suppliers of fabricators included in the Justice Department's survey. Aside from indicating the extent of jobber activity in this field, the table shows that some producers also engage in marketing various kinds of synthetic rubber which they themselves do not produce. This practice, it was said, apparently is employed either from a desire to market a rounded line of products or merely to accommodate a few favored customers. The practice is comparatively limited, however, and seems to have no effect on the price structure, the Report concluded.

In discussing the small business aspect of industry activities last year, Rogers confessed to some difficulty in defining just what did constitute a "small" business. One company responding to questions in his survey considered sales to all but the Big Five rubber companies as "small business"; another, Rogers reported, "frankly admitted its inability to make any determination of what constitutes a small business." The Attorney General, complaining that the Disposal Act and other statutes relating to the encouragement of "small business" gave no details, reports that he resolved the question by appropriating this criteria from the Census Bureau:

"In the field of rubber products, firms making rubber footwear or tires and inner tubes are considered small business if they average up to 1,000 employes. For rubber industries not

TABLE 3. SBR PLANT CAPACITY,* BY COMPANY, 1955-58

Company†	May 1, 1955 Long tons (000)	Dec. 31, 1957 Long tons (000)	Anticipated Capacity Dec. 31, 1958 Long tons (000)
Goodyear (1)	146.5	255.6	255.6
Firestone (3)	129.6	230.0	230.0
Goodrich-Gulf (2)	95.0	232.0	242.0
Shell (5)	94.0	126.0	126.0
Texas-U. S. (4)	88.0	127.0	143.0
Phillips (6)	69.4	111.0	133.0
United Rubber (8)	‡62.0	69.8	69.8
Copolymer (7)	49.0	75.0	95.0
A. S. R. C. (9)	44.0	68.5	68.5
U. S. Rubber (11)	22.2	30.0	30.0
General (10)	—	40.0	40.0
All other§	—	22.8	23.3
Total	¶799.7	1,387.7	1,456.2

*Productive capacity, including the weight of oil and carbon black, and assuming the "normal pattern of production" experienced by the company.

†Companies are listed in order of relative size at the time of transfer to private ownership; ( ) following company name identifies the rank in order of 1957 S-type capacity.

‡Capacity on July 15, 1955, when plant was transferred to United Rubber & Chemical Co.

§Includes Dewey & Almy Chemical Division, W. R. Grace & Co., and International Latex Corp.

¶Revised.

Source: 1955 data from **Second Report**, p. 9; 1957 and 1958 data based on information furnished to the Department by the producers.

especially classified, the employment limit is 500."

Synthetic Consumption Gains

Noting that synthetic continues to dominate the rubber consumption picture, the Report points out that new rubber consumption in 1957, though 65,000 long tons below that of the record year of 1955, totaled 1,464,640 long tons, 2% above the 1956 figure and "immeasurably greater than the level of the years preceding 1955."

The increase over 1956 usage, it continued, resulted from a steady rise in synthetic consumption, and while natural rubber continued to decline, falling 4% below 1956 totals, synthetic rose to a record consumption total of 925,879 long tons, topping the previous year by 51,000 tons. At year-end, synthetic's share of total consumption was 63%, compared with 61% in 1956 and only 41% in 1948.

Annual production of the four basic synthetics — SBR, butyl, neoprene, and nitrile, the only rubbers considered in the Report — rose in 1957 to 1,118,173 long tons, 3.5% ahead of 1956 output. SBR made up the bulk of production, accounting for 81% of the total; while neoprene was 10%, butyl 6% and nitrile rubber 3%, respectively. Compared with 1956, these totals reflect a 1% jump for neoprene, a commensurate loss for butyl, and a relatively constant SBR and N-type share.

Commenting on the way expansion outpaced demand, the Report said SBR in 1957, when production outmatched consumption by 200,000 tons, operated only at 65% of capacity. Butadiene by the end of the year was operating at an annual rate of only 56%. It is with these figures in mind that the Attorney General reports his concern that prices, with some exceptions in butadiene and in freight allowances, remain what they were when the government was running the industry.

Since the takeover by private ownership, he continued, increases in synthetic rubber production, sales, share of total consumption, and capacity have all increased markedly, yet "prices have been held uniform and stable." This uniformity, he said, may be attributable to the competitive relation between natural and synthetic rubber, but he went on to point out that during 1957 the natural rubber market softened considerably, and natural prices dropped at some points to where the two were directly competitive.

"It remains to be seen," Rogers said in concluding this section of his Report, "whether a continuation of this (natural) decline may make adjustments necessary in the synthetic price structure later in 1958."

Discussing the export market for synthetic during the year, Rogers said the record high of 200,000 tons sold abroad — 36% over 1956 — indicates a "continuing breakdown of the traditional European preference for natural rubber." He estimated that consumption of synthetics in Europe is now 20% of total new rubber consumed there, as against only 8% two years before in 1955. The Attorney General warned, however, that some shrinkage of export outlets can be looked for as Europe and Japan bring plants of their own on stream. He did not refer to the dropoff in total United States exports brought on by the recession, but said synthetic shipments in 1958 are likely to fall 10% behind 1957 levels.

SBR Expansion

Examining the pattern of 1957 in the industry's biggest segment, SBR production, Rogers reported that overall the five largest producers of the firms which were involved in the original plant disposal program had lost ground in domestic sales, but had got a stronger collective hold on capacity and production. As a result of the first round of plant expansion undertaken by the new purchasers in 1955, overall productive capacity had risen from 799,000 long tons annually to almost 1,400,000 tons by the end of 1957 — a jump of 73% in 2½ years. (See Table 3.) With the initial expansion programs practically spent, the rate will slow considerably into 1958, when only 68,000 new tons will be added.

The big gainer in terms of relative position in the 2½-year building program was Goodrich-Gulf, whose capacity has risen from the 1955 level of 11.9 to 16.7% of the total. Goodyear and Firestone, first and third, respectively, held approximately the same share of capacity at the end of 1957 as they did in mid-1955. Each of the others lost some ground during the period.

The three leaders together account for half of the industry's total capacity, production, and sales. Where in 1955 each of the five leading companies held more than 10% of capacity, production, and sales — or again, half the industry — the total now stands at three, Shell and Texas-U. S. having lost out both to the Big Three and smaller companies which have been increasing their positions in these markets.

SBR Output by Types

Similar changes in the complexion of the industry were reported on the technological front. Since the introduction of the process, the Report said, cold rubber has gradually displaced regular SBR as the dominant category of production. Together with cold oil masterbatch, cold rubber made up 73.6% of overall production last year, compared with previous totals of 68.5% in 1956 and 64% in 1955.

Particularly noteworthy, the Report added, was the jump in cold oil-masterbatch production as a portion of total

TABLE 4. PRODUCTION OF SBR, BY CATEGORIES, 1955-57

Category	May-Dec., 1955 Long Tons*	May-Dec., 1955 %	1956 Long Tons*	1956 %	1957 Long Tons*	1957 %
Regular SBR	139,735	27.4	190.375	23.7	158.949	19.4
Cold SBR	211,092	41.4	357,964	44.6	364,593	44.4
Cold oil-masterbatch	115.172	22.6	191,476	23.9	239,965	29.2
Cold oil black-masterbatch	16,201	3.2	15,136	1.9	18,257	2.2
Cold and regular black masterbatch	27,670	5.4	47.632	5.9	39,132	4.8
Total	509,870	100.0	802,583	100.0	820,896	100.0

*Does not include oil or carbon black content.

Source: Department of Commerce, **United States Rubber Statistics** (Feb., 1956, Feb., 1957, and Feb., 1958).

SBR produced. Because of its relatively cheap production costs, it jumped from 22.6% of production in 1955 to nearly 30% last year. (See Table 4.)

Plant specialization, which originally began before World War II, continues apace under private ownership, the Report stated. Each category of production requires "individual study of its developing pattern of competition," it was said, although at this time specialization appears to have had "only a minor inhibiting effect on overall competition in the industry." Noted in this connection is the "precipitous decline" in the share of a smaller company in the industry, American Synthetic Rubber Corp. (A.S.R.C.), as a factor in the production of cold SBR. While Goodyear was rising rapidly to third in this field, A.S.R.C. slid from 6.6% of total output in 1955 to 3.1% in 1957, or from third to fifth place. Offsetting this loss for A.S.R.C., however, was a noted increase, from relatively nothing to a "respectable" 4% in the total production of regular SBR, even though this rubber's share of total synthetic output has been losing out to cold rubber processes.

It was in connection with process and product specialization that the Attorney General found the least amount of competition in the industry. He observed that in the case of black masterbatch production, the total of which accounts for only 7% of total synthetic production, there were only five firms active, two of them insignificant factors in the market for this category. The three principal producers of black masterbatch—United Rubber, Phillips Petroleum, and Shell Oil—also are the only producers of oil-black masterbatch, he said.

In synthetic latex production, Goodyear, Firestone, and United States Rubber "still dominate," the Report said. On the other hand, Copolymer and Goodrich-Gulf "displayed a strengthening of their positions at the expense of the larger companies in this field."

Patents and Technology

The Report emphasized that patent rights do not seem to be an obstacle to new entries in the synthetic market. The newcomers report they are employing independent processes of their own, and General Tire has availed itself of the patent and technological rights still held by the government. In this connection, the Report said that last year the government, through the Commerce Department's Office of Technical Services, released about 1,500 research papers dealing with federal development programs for synthetic rubber.

SBR Sales Distribution

Discussing sales developments in 1957, the Report said that more than half of SBR sales represented intercompany transfers of sales to affiliated or constituent companies. (See Table 5.) More than 58% of total production, moreover, went into the hands of the Big Five of the rubber industry, and it estimated that only one-third of total SBR sales last year were "open market" sales to fabricators. The Report added here that "slightly more than half" of the producing segment of the SBR industry continues to use sales contracts with larger customers. It indicated this practice may be modified inasmuch as the principal advantage of sales contracts—the assurance of a steady supply—"had no applicability" in 1957 because of oversupply conditions.

It was in the sales field, however, that the Attorney General found one of the most encouraging signs of the growth of competition. Although price modification was absent from this picture, "there has been considerable competition in the area of technical services," Rogers said. A relatively new feature of the sales and distribution activities of the SBR industry, the Attorney General stated, these technical services not only have produced "sharp competition" as among producers for fabricator sales contracts, but they also have provided "an important aid in the fabrication of (new) synthetic rubber products."

As mentioned previously, exports of synthetic rubber reached a new high of more than 200,000 tons in 1957. Although shared by all types, this increase was principally SBR, which comprised more than three-quarters of total exports.

Table 6 shows that virtually all producers of SBR engaged in some export trade during 1957; Goodyear, Firestone, and Goodrich-Gulf, however, furnished the bulk of the exports. The aggregate share of these three companies declined from 82% in 1956 to 68% in 1957, as other companies began to enter this market. In addition, the foreign market continued to broaden. While almost half the 1955 exports went to foreign subsidiaries and affiliates, this ratio declined to 43% in 1956 and by 1957 dropped below 40%.

Consumption of synthetic rubber in Europe is now nearly 20% of total new rubber, as compared with an estimated 8% in 1955. A possible future 10% cut in exports from the U. S. is anticipated, however, because of additional European synthetic rubber production beginning in 1958.

By the end of 1958, Great Britain will have 30,000 tons capacity; France, 20,000 tons; Germany, 60,000 tons; and Italy, about 30,000 tons, with plants in Holland and Japan in later years.

TABLE 6. PERCENTAGE DISTRIBUTION OF SBR EXPORT SALES, 1957

Company*	Total Exports	Sales to Subsidiaries and/or Affiliates	Sales to All Other Foreign Customers
Goodyear (1)	30.8	21.3	9.5
Firestone (3)	21.9	13.6	8.3
Goodrich-Gulf (2)	15.5	...	15.5
Phillips (6)	14.7	..	14.7
Texas-U. S. (4)	5.4	.	5.4
General (10)†	4.8	4.8	
United Rubber (8)	2.5	..	2.5
A. S. R. C. (9)	2.3	‡	2.3
Shell (5)	1.3	..	1.3
U. S. Rubber (11)	0.7	0.2	0.5
Copolymer (7)	0.1	...	0.1
Total, all companies	100.0	39.9	60.1

*( ) following company name identifies rank in order of total 1957 S-type capacity.

†Since General went into production only at the end of 1957, these figures do not reflect its operations on an annual basis.

‡A small portion of exports went to Dewey & Almy Overseas, which is a subsidiary or affiliate of Dewey & Almy Chemical Division of W. R. Grace & Co., one of the constituent companies of A. S. R. C.

Source: Data based on information furnished to the Department by the producers.

TABLE 5. PERCENTAGE DISTRIBUTION OF DOMESTIC SBR SALES, 1957

Company*	Intra-company Transfers	Sales to Affiliated or Constituent Companies	Sales to "Big 5"†	All Other Sales	Total Domestic Sales
Goodyear	16.1	...	0.5	6.5	23.1
Goodrich-Gulf	...	9.0	0.1	3.0	12.1
Firestone	13.0	...	0.9	5.2	19.1
Texas-U. S.	...	7.4	0.2	1.6	9.2
Shell	...	...	4.1	4.4	8.5
Phillips	...	...	2.4	5.9	8.3
Copolymer	...	5.0	0.8	1.4	7.2
United Rubber	...	...	3.2	3.0	6.2
A. S. R. C.	...	2.0	§	1.7	3.7
General‡	§	...	..	0.1	0.1
U. S. Rubber	0.8	...	0.2	1.5	2.5
International Latex‡	...	...	...	§	§
Total domestic sales all companies	29.9	23.4	12.4	34.3	100.0

*Companies are listed in order of rank based on total 1957 S-type capacity.

†Excluding affiliated or intracompany sales.

‡Since these companies went into production only at the end of 1957, these figures are not representative of their operations on an annual basis.

§Less than 0.1 of 1%.

Source: Data based on information furnished to the Department by the producers.

INDUSTRY NEWS

Nitrile Silicone Rubber Announced; Competitive with Fluororubbers

A new-type nitrile silicone rubber discovered by General Electric Co.'s scientists at Schenectady and Waterford, N. Y., combines oil resistance with the ability to maintain strength and usefulness at temperatures ranging from a sub-arctic —100° F. to the 500° F. required for modern jet aircraft. The announcement was made at the Park Lane Hotel, New York, N. Y., on August 14, by Guy Suits, G-E vice president and director of research, and by Charles E. Reed, general manager of the company's silicone products department. Also, Maurice Prober, G-E research laboratory, described the basic chemistry behind the new rubber; B. A. Bluestein, silicone products department, discussed the development and properties of nitrile silicone rubber; and Dr. Reed spoke on the potential applications for the rubber.

He stressed that the new rubber can be processed in ordinary rubber fabricating equipment. It will be basically a less expensive material than the fluoro rubbers which offer oil and heat resistance only at the sacrifice of other important properties. Reed stated that this new material will qualify for an aircraft industry specification for a sealant for integral fuel tanks which must withstand temperatures from —65 to +350° F. He also indicated that the new rubber would be available commercially before the end of 1958. The introductory price is expected to be about $15.00 a pound.

Basic Chemistry

In describing the basic chemistry behind the nitrile silicone rubber, Dr. Prober said that the nitrile group was selected as a side chain on the silicon-oxygen polymer backbone because it produced a large shift in the swelling characteristics. This nitrile silicone rubber can be made from a simple silicone molecule via a series of synthetic organic reactions—chlorination, a Grignard reaction, and polymerization.

The properties of the new rubber are influenced by the length of the carbon side chain, this speaker continued. As the number of CH_2 groups between the nitrile and the silicon atom increases, the influence of the polar nitrile group decreases. Also affecting the properties of these nitrile silicones is the repeat frequency of the nitrile side chain which can be altered by controlling the starting materials in the polymerization.

The influence of the polar nitrile group can be seen by examining the swelling of a sample when immersed in aviation gasoline. (See Figure 1). In this test, a severe test for oil resistance, the rubber showed low solvent swelling, thus demonstrating that by building polar nitrile groups into the silicone molecule an oil-resistant rubber is achieved.

Properties

Dr. Bluestein, in discussing the development and properties of the new rubber, said that the first problem solved was that of finding a commercially practical, economic synthesis for the nitrile-containing silicone. An essential part of this synthesis is the fact that the resulting chemical intermediate must be of extremely high purity. This intermediate is first converted to a fluid by hydrolysis and then to a high molecular weight polymer. It is then mixed with a filler and a vulcanizng agent before being heated in a mold to produce a rubber.

The result of this development, he stated, is the nitrile silicone rubber which has a unique combination of important properties. The primary property of interest is that of oil or fuel resistance. Figure 2 shows the comparative volume increase or swell of a standard silicone rubber and a nitrile silicone rubber in three selected fuels. The reduction in swell of the nitrile silicone rubber is calculated to be a factor of about 10.

Less striking, but effective results are evident in Figure 3, where swells are given for three types of oil after 70 hours at 300° F., and, in all cases, the nitrile silicone rubber has only a low degree of volume swell. Similar results are noted at even higher temperatures.

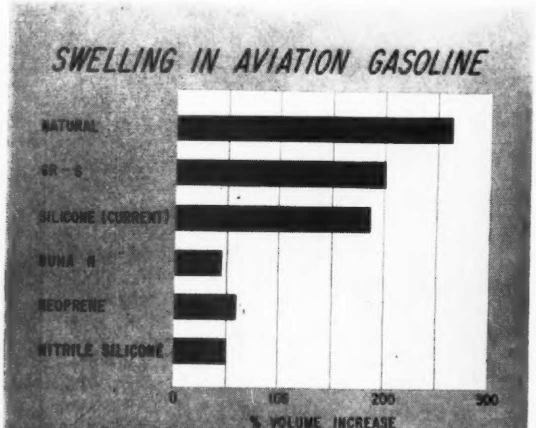


Fig. 1. Comparison of swelling in aviation gasoline of nitrile silicone and other rubbers

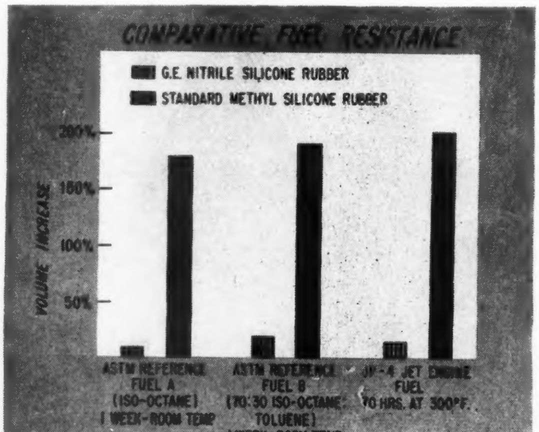


Fig. 2. Comparative volume increase of methyl and nitrile silicone rubbers in three fuels

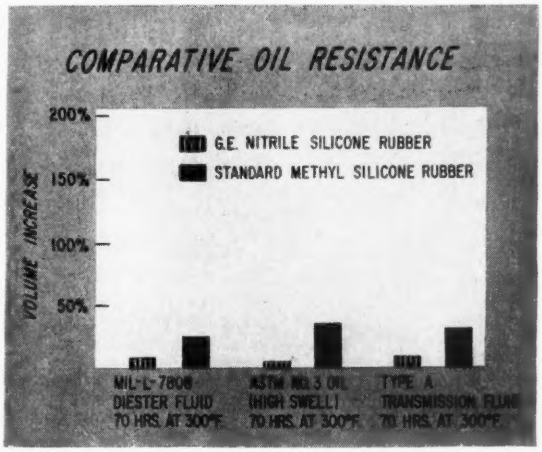


Fig. 3. Comparative volume increase of methyl and nitrile silicone rubbers in hydraulic fluids

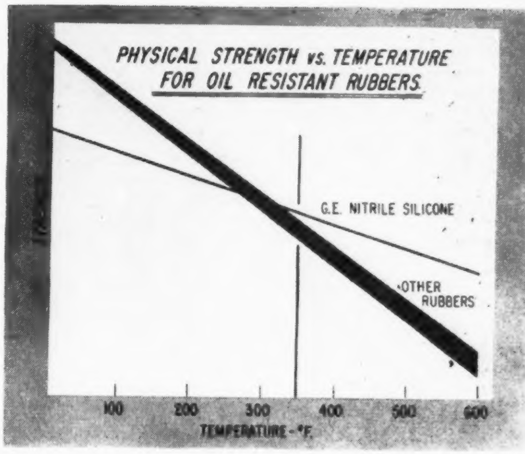


Fig. 4. Physical strength vs. temperature for nitrile silicone compared with other rubbers

Also, this new type of rubber maintains its strength and rubbery character at a much higher temperature than non-silicone rubbers. (See Figure 4.) It has been demonstrated that the tensile strength of most rubbers decreases quite rapidly as the temperature increases. Silicone rubbers, however, are different in that they retain much of their original strength, and, in general, above 350° F. silicones are stronger than other rubbers. The nitrile silicone rubbers also exhibit this retention of strength with increase in temperature.

A. L. Marshall, manager, chemistry research department, G-E research laboratory, gave a brief, but interesting history of research in silicone chemistry, and he also commented on the background of the silicone rubber industry.

Applications

Dr. Reed, in discussing the potential applications for the new rubber, indicated that it is expected to find many applications in O-rings, seals, and gaskets in aircraft engines and hydraulic systems which are in constant contact with fluids. The aircraft industry, already an important user of silicone rubber, is expected to be one of the primary users of this new material as it will offer the solution to many more aircraft design problems.

The automobile industry also has use for an oil-resistant, heat-resistant rubber, though its requirements are less severe than are those of the aircraft industry. Important automotive applications will include automatic transmission seals, differential pinion seals, crank shaft seals, and power-steering pump seals. Rubber brake parts and new air-suspension gaskets are expected to be made from the new-type silicone rubber. Other applications will be found for this material in the electrical apparatus industry and in the petroleum industry.

Naugatuck in Italy

United States Rubber Co., New York, N. Y., and Rumianca Co., Turin, one of Italy's largest chemical firms, have announced that they are jointly forming a new company in Italy to manufacture and sell a line of chemical products developed and manufactured by the rubber company's Naugatuck Chemical division.

The new company, to be called Naugatuck-Rumianca, S.p.a., will have its headquarters in Turin and its manufacturing plant in Borgaro Torinese, a suburb of Turin. Among the products it will make and sell are accelerators and antioxidants for the rubber industry, a group of agricultural chemicals, and a series of chemical specialties. The products, patented by Naugatuck Chemical, will be made and sold on an exclusive basis in Italy and sold on a non-exclusive basis in several other countries.

Until the new firm's manufacturing plant is erected, Naugatuck-Rumianca plans to import and sell in Italy all of Naugatuck Chemical products. The rubber company's chemical division is said to be one of the country's largest producers of rubber chemicals. Among its other products are plastic materials, agricultural chemicals, and synthetic rubber.

Rumianca has been a chemical producer for more than 40 years. Its products include heavy chemicals, industrial chemicals, and fertilizers. The products to be made and sold by the new firm will supplement Rumianca's present line and enable it to provide a full selection of chemicals for Italy's growing rubber industry and also chemicals for Italy's agriculture.

Product know-how and technical assistance in constructing and starting up the new plant will be provided by the rubber company. The new Italian plant's technical personnel will be trained at the main plant of the rubber company's chemical division at Naugatuck, Conn.

Ownership of the new firm will be jointly divided between Rumianca and U. S. Rubber.

Joint Study of Europe

Robert S. First, industrial consultant, and Foster D. Snell, Inc., consulting chemists and engineers, New York, N. Y., have organized a joint intelligence project to bring scientific discoveries of commercial significance in Europe to the attention of American industry. The survey will cover "European Process and Product Technology" and is open on a subscription basis for a limited number of clients. The project will involve the chemical, plastics, and pharmaceutical industries in eight European countries—England, France, Holland, Belgium, Italy, West Germany, Sweden, and Switzerland.

The project, requiring about a year to complete, will yield a detailed report of the products and processes available for license, the raw material involved, the United States market potentials, and discussion of the economic-technical feasibility of the project in the United States. The survey will seek profit opportunities for both United States and European companies.

European process and product technology will be surveyed as a joint project by First and Snell in order to utilize the diverse and complementary backgrounds and experience of each. Foster D. Snell, Inc., is a 38-year-old firm of chemists, engineers, bacteriologists, and market researchers. Its principal activities are product research and development, product improvement, product application, toxicology, and engineering for the chemical and chemically allied industries. Robert S. First specializes in expansion and diversification studies, distribution analysis, and economic research.

"Sales Vigor in the Corporation"

The systematic comparison of a company's sales effort with the practices of the best managed companies is the subject of the latest book in the American Institute of Management's 10-category series on overall corporate management. In the form of a 115-page monograph called "Sales Vigor in the Corporation," the book sums up 10 years of research in this area of management study among top American and Canadian corporations. A limited number of copies is available from AIM, 125 E. 38th St., New York 16, N. Y.

"Sales Vigor" poses the questions asked in conducting an audit or appraisal of a company's sales efforts and interprets both the questions and the answers. The object is not only to be able to do a professional study of a sales effort, but to show how to pick out assets of the program in order to capitalize on them and to pick out weaknesses in order to correct them.

Industry Framework

Among the first questions AIM poses in appraising management performance of a company are the following: (1) Where and what were the company's original markets? (2) When and how have these changed? It is important to understand the framework of an industry before assessing the specific problems a management encounters in it.

Also, who are the company's largest competitors? What share of the market is now enjoyed by each competitor and the company itself? Ideally, the company should be able to list its competitors and to provide quite precise figures as to share of market over a period of years, although the AIM study admits that sometimes this calculation is impossible.

Then there is the question of the quality of competition in the market and the means of exchanging information with competitors. Sales data of all a company's competitors is a more than fair exchange for releasing one's own figures, but there are limits to the friendly interchange of data since such practices can lead to outright collusion on prices and improper sphere-of-influence agreements.

This study emphasizes that in studying the best-managed companies, AIM has found that imagination in a sales program, even when occasional mistakes occur, is perhaps the key ingredient.

Distribution

The management auditor who ignores the channels through which a company distributes its products ignores one of the basic facts of its existence, it is said. The Institute has often discovered in its audit of a less well-managed company that it has never taken the first basic step in sales analysis—that of a census of outlets. Without it, sales analysis is impossible, and without some form of sales analysis, control of costs and profits becomes a hit-or-miss matter.

Service

The obvious truth that no company, whatever its chosen field of activity, can neglect the provision of adequate service to clients or customers is underscored.

Also, a properly organized customer service department should have set procedures for handling complaints, including an initial acknowledgment to the customer which states the manner in which the complaint will be handled, if it cannot be cleared up in a few days.

Organization

One of the most significant developments in sales organization in recent years has been the appearance of the line director of marketing, and while this development is perhaps 15 years old, it has recently gained momentum. In actuality, a good marketing director is invaluable, it is said, since he has the breadth of vision to view the company's marketing program in its entirety, without concern as to the essential administration of it.

Included also in this section is a summary of the attributes of a good sales manager.

Other Subjects

Other subjects covered in considerable detail in this study include pricing, training, compensation, market research, advertising, sales promotion, and public relations.

The book should be particularly useful to many rubber industry companies presently looking for means of improving their sales effort.

Replacement Passenger, Farm Tire Sales Up

A bright spot in the rubber industry picture today is replacement passenger-car tire sales. Industry six-month reports show that shipments of replacement passenger tires to retail outlets are running about 3.6% higher than for the same period last year, according to Guy Gundaker, Jr., vice president of replacement sales, B. F. Goodrich Tire Co.

Shipments totaled 31 million units through June, compared with less than 30 million during the like period last year. Second-quarter shipment figures are nearly 10% higher than for last year's second-quarter total, which point is particularly heartening since first-quarter sales were down 4% from 1957's equivalent period.

If replacement passenger tire sales continue to run at the present rate, Gundaker expects 1958 shipments to amount to more than 58 million, which would top 1957 shipments by about a million and a half units.

Gundaker cites as reasons for the continuing high sales of passenger tires in a recession year the average number of cars expected on the road by the year's end at more than 53 million, nearly two million more than last year, and the eight million cars produced in 1955, which now have worn out their original-equipment tires. Still another reason given was that today's high-speed driving contributes to rapid tire wear.

Gundaker said that industry shipments for the first six months of this year of farm-equipment tires also ran about 21% more than during the same period last year. More than one million units were shipped between January and June of this year, as compared with slightly less than 850,000 during the same months of 1957. He credits this increased farm-tire sales picture to personal income in agriculture which is up nearly 10% over a year ago owing to higher prices for farm products.

Farm-tire replacement shipments are now estimated to exceed 1,700,000 units in 1958 and may pass the 1,739,000 shipped in 1947.

Armstrong Installs Dielectric Dryers

Armstrong-Norwalk Rubber Corp., at its Norwalk, Conn., plant, has installed a pair of huge, high-frequency dielectric drying units which will be used in the automatic drying of intermixed foam rubber mattresses, pillows, seat cushions, pads, and other products in its foam rubber line. The Thermex system, built by the Girdler Process division of Chemetron Corp., uses two back-to-back 200 kw. high-frequency electronic units capable of drying 120 double-bed mattresses per hour in extremely short cycles. The units occupy only one-tenth the space formerly needed by the high-temperature air method which required long exposure time.

Electronic drying is said to be uniform and rapid on all parts of the molded pieces. Action of the high-frequency field is such that heating automatically stops when the piece is completely dried regardless of cross-section, density, or initial moisture content. The Thermex system has been successfully used in many other applications including the preheating of plastic molding materials and the drying of textile fibers.

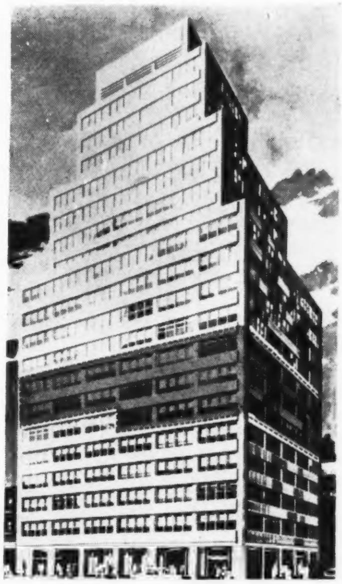
Armstrong-Norwalk Rubber Corp. distributes foam rubber products under the Pure Foam trade mark.

NEW RUBBER WORLD OFFICES IN OCTOBER

The home office of RUBBER WORLD will move to new, larger quarters in October of this year, together with the eight other magazines of Bill Brothers Publishing Corp.

In an expansion and consolidation move involving its entire New York staff, Bill Brothers Corp. has leased 2½ floors containing 25,000 square feet of floor space in the 22-story building being erected at 630 Third Ave., southwest corner of 41st St. and opposite the new Socony-Mobil building. RUBBER WORLD will be located on the eighth floor of this new, air-conditioned building. The telephone will be YUkon 6-4800.

Bill Brothers Publications have taken the position in their editorial pages during the past several months that ours is a rapidly growing economy, that we are approaching the greatest boom in the history of the nation, that you cannot economize yourself into a profit, and that the business trend at the present time is starting to head upward after the recession which began during the second half of 1957.



RUBBER WORLD'S new home after October. Darkened areas show space for Bill Brothers

The nine magazines[1] of the Bill Brothers organization began the year 1958, therefore, with the policy of spending more on editorial content, personal selling, and advertising and circulation promotion, in order to increase their share of the market on every magazine, and the results have been extremely good. Each of the magazines is ahead of the 1957 period. (First six months 1958 vs. 1957—4.0% in pages, 13.6% in dollars).

So in moving to these larger and more expensive quarters, Bill Brothers publications are translating words into action. It may turn out that dividends will have to be sacrificed, in part at least, in favor of development. It is a calculated risk—based upon the sincere conviction that the future looks bright indeed, and that future *years* are more important than current *months*.

Look us up after October!

[1] In marketing, *Sales Management, Sales Meetings, Tide, Premium Practice;* in merchandising, *Fast Food, Floor Covering Profits, Tires-TBA Merchandising;* in industry, RUBBER WORLD and *Plastics Technology*.

UCC's New LE-46 Mold Release Agent

Tire manufacturers and retreaders can save money on their bills for rubber mold release agents by switching from silicones of a low viscosity to silicones of a high viscosity. Conventional silicone emulsions are based on a silicone fluid of moderate viscosity, of about 300 to 500 centistokes. Today, compounders in several rubber companies are working with a newer emulsion, Union Carbide Corp.'s LE-46, which contains 10,000 centistokes fluid. Their experience has been that considerable economies are possible with this newer product, according to the silicones division, Union Carbide Corp., New York, N. Y.

Explanation for this point seems to be based on the fact that a fluid of high viscosity provides a more substantial film at mold temperature. This film is less mobile and more durable than that afforded by low viscosity fluids. Until recently, difficulties in emulsifying viscous fluids had prevented the commercial use of a viscous fluid emulsion. The problem has been solved by the development of LE-46.

Within the last year several companies have tried LE-46. They found that it was satisfactory, and that the same amount of fluid lasted longer, so that considerable savings were effected. LE-46 is an oil-in-water emulsion with excellent stability. It has a concentration of 35% by weight silicone oil and weighs 8.27 pounds per gallon.

Schulman's 30 Years

A. Schulman, Inc., Akron, O., a leading reprocessor of rubber and plastics, marked its thirtieth anniversary on August 15. The company started in business in Akron in 1928. Today Schulman is internationally known in the reprocessing of vinyl and polyethylene plastics. It is also a worldwide sales agency for Plioflex, the general-purpose synthetic rubber manufactured by the Goodyear Tire & Rubber Co.

A. Schulman, Inc., has rapidly advanced to a world-wide corporation with plants in Akron, O.; East St. Louis, Ill.; Boston, Mass.; Dorsett, O.; Bellevue, O.; London, England; and Hanover, West Germany. In addition, regional sales offices are located in Boston, Los Angeles, New York, Tokyo, France, Italy, and Spain, as well as London, Hanover, and Brussels.

The reprocessing company recently appointed Cobak-Jessop Advertising Co., 85 W. State St., Akron, O., as its advertising agency.

NAWMD's New Staff

The reorganization of the executive staff of the National Association of Waste Material Dealers, Inc., New York, N. Y., was recently announced by George H. Einhauser, president of the Association. M. J. Mighdoll was elected administrator and secretary of the organization. Clinton M. White, who has held the position of executive vice president and secretary, was named as consultant to NAWMD by the board.

A plan was outlined whereby two Association staff executives will serve as secretaries to its eight commodity divisions. Harold C. Rowe was named to serve as secretary of the Cotton Rag Council, Foreign Trade Division, Scrap Rubber & Plastics Institute, Textile Fibres Institute, Waste Paper Institute, and Wool Stock Institute. The new addition to the staff will be forthcoming.

The executive changes were made by the board of directors to assure NAWMD of an effective team of executives to handle the mounting programs, activities, and functions of the Association and its commodity and regional divisions. The Association is expanding its services and activities in order to provide its membership with an association able to meet modern business demands.

U. S. Rubber Adds New Textile Department

A program to expand and diversify its operations in the industrial textiles business has been put into effect by the textile division of United States Rubber Co., New York, N. Y. A new department, the industrial textiles department, has been formed by merging the Asbeston sales department with the industrial yarns and fabrics department. As a first step in expanding the company's operations in the industrial textiles field, eight sales representatives have been assigned to new company territories throughout the United States. Plans have also been made for expansion of production facilities at three of the company's 11 textile division plants.

Frederick T. Hopkins, formerly manager of industrial yarns and fabrics, has been appointed sales manager of the new industrial textiles department. Also, Herbert E. Sunbury, formerly manager of Asbeston sales, has been named to the new position of sales development manager of industrial textiles. B. D. Hubbard and F. C. Hopkins were assigned to the new positions of new product development and technical service supervisors.

The sales representatives and their territories are: John Fowler, Midwest; W. H. Bric and Stewart Smith, West Coast; Don Nichols, southeastern states; Hugh Savage, New England; Staton Peele and Walter Hitchcock, Metropolitan New York, New Jersey, Pennsylvania, Delaware, and Maryland; and J. W. Reid, central Pennsylvania.

Among some of the textile division's current products are hose and belt duck, chafer fabrics, rayon and nylon tire cord, mechanical yarns for weaving and braiding, synthetic industrial yarns for chemical filtration, Ustex yarns and fabrics for woven and braided jacket hose, conveyor belts, wrapped hose, wire and cable reinforcements, safety and aircraft webbings, and industrial sewing threads. It produces Asbeston materials for steam pipe jackets, heating and ventilating ducts, electric insulating tapes, yarns for electric wire insulation, polyethylene yarns for use in auto seat covers, industrial filters, braids, and insulation and marine fabrics.

Shaw Elected President Of Rubbermaid, Inc.

James R. Caldwell, president and founder of Rubbermaid, Inc., Wooster, O., has announced that he resigned the presidency and has become chairman of the executive committee of the board of directors. He served as president of the company since its beginning in 1934.

In approving his request to be re-

(Left to right): Forrest B. Shaw, James R. Caldwell, and Donald E. Noble

lieved of full-time leadership of Rubbermaid, the board of directors named him to the newly created post of chairman of the executive committee. Succeeding Caldwell as president and general manager is Forrest B. Shaw, who has been vice president and assistant general manager.

The board also elected Donald E. Noble, vice president in charge of finance, to the new position of executive vice president in charge of finance. In other board action, J. Richard Raeder was promoted to the newly created office of controller; while Thomas G. Clark was named to fill Raeder's former position of assistant secretary-assistant treasurer. Clark formerly was supervisor of general accounting.

Shaw, the new president, has had 33 years' experience in the rubber business. He joined the Wooster company (the corporate name of which was changed to Rubbermaid, Inc., earlier this year) in 1945 as production manager and was subsequently promoted to vice president in charge of manufacturing. In December, 1957, he was named vice president and assistant general manager.

Noble started with Rubbermaid in 1941 as assistant office manager. He became secretary-treasurer in 1942 and was named vice president in 1956. Raeder came to Rubbermaid in 1954 as chief accountant and was elected assistant secretary-assistant treasurer in 1955.

Enjay Enters Plastics; Markets Polypropylene

Enjay Co., Inc., New York, N. Y., a leading marketer of petrochemicals, recently announced its entry into the plastics field with plans to market polypropylene through its own sales organization and under a sales agreement will supply Spencer Chemical Co. with polypropylene for resale throughout the United States.

A newcomer to the plastics field, polypropylene, a linear polymer is being produced from refinery propylene gases. It combines in one material the properties of lightness, high strength, high rigidity, resilience, and hardness and resistance to heat and to many chemicals and solvents.

Enjay will be supplied with polypropylene from a plant to be constructed and operated by the Humble Oil & Refining Co. The plant will have an initial output of 40 million pounds a year. Commercial quantities of polypropylene will be available early in 1960; however, market-development quantities will soon be available from a ton-a-day pilot plant.

Spencer Chemical, a producer and marketer of polyethylene, nylon, and industrial and agricultural chemicals, with headquarters in Kansas City, Mo., has chemical plants in Pittsburg, Kan.; Fort Worth and Orange, Tex.; Vicksburg, Miss.; Calumet City, Ill.; and Henderson, Ky. Enjay, with headquarters in New York, has sales outlets throughout the United States and abroad. It markets a full line of petrochemicals; polymers, including Enjay Butyl rubber; fuel and lube-oil additives; and chemical intermediates.

At present, only one other American firm, Hercules Powder Co., manufactures and markets polypropylene.

Honorary Committee For Akron U Program

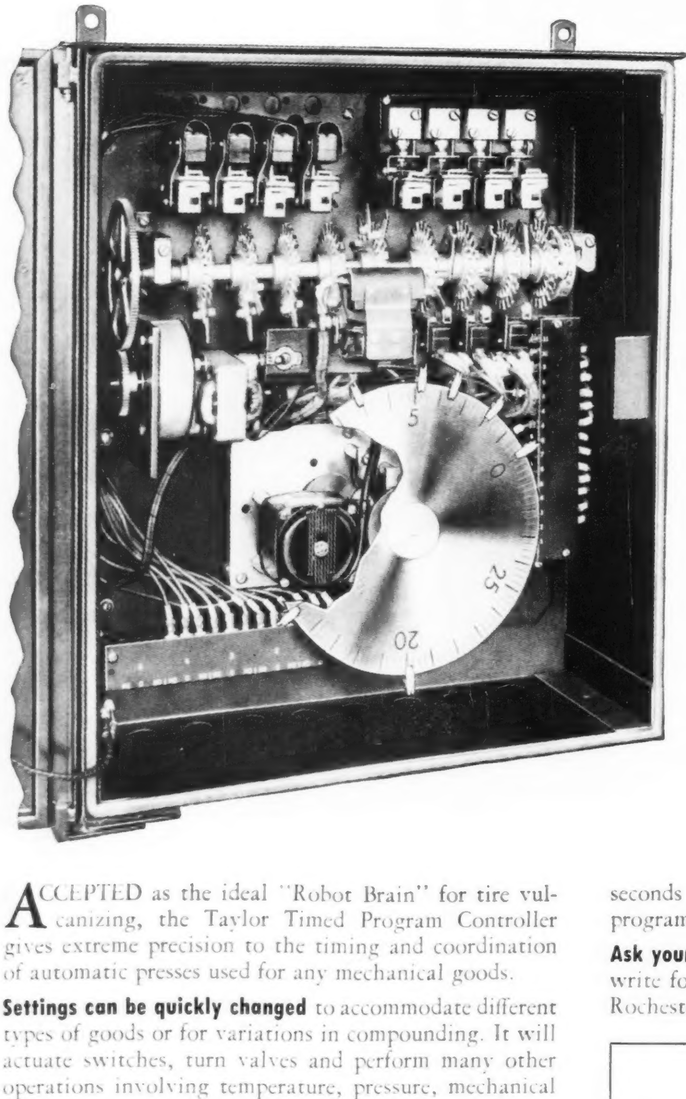
Six of Akron's major rubber industrial leaders have been named to an honorary committee for the University of Akron's "50th Anniversary of the Teaching of Rubber Chemistry," an all-day event to be held October 3.[1]

Chairman of the committee is Paul W. Litchfield, chairman of the board, The Goodyear Tire & Rubber Co. Serving with him are John L. Collyer, board chairman, The B. F. Goodrich Co.; Harvey S. Firestone, Jr., board chairman, The Firestone Tire & Rubber Co.; William O'Neil, president, The General Tire & Rubber Co.; J. P. Seiberling, president, Seiberling Rubber Co.; and R. E. Bloch, board chairman, Mohawk Rubber Co.

Harry P. Schrank, general chairman of the Akron U organizational committee and also a member of the University's board of directors, has asked Hurl J. Albrecht, Akron U board chairman, to pledge the support of the entire board to the anniversary program. These members, all on a separate committee, are L. S. Buckmaster, president of the International URCLPWA, AFL-CIO; Mrs. Walter A. Hoyt; Attorney Lee Ferbstein; Charles J. Jahant, vice president, General Tire; F. J. Ward Keener, president, B. F. Goodrich; E. J. Thomas, president, Goodyear; and Joseph Thomas, vice president, secretary, and general counsel, Firestone.

[1] See RUBBER WORLD, Aug., 1958, p. 762.

WHATEVER YOU VULCANIZE YOU'LL VULCANIZE BETTER



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Taylor Instruments

MEAN ACCURACY FIRST

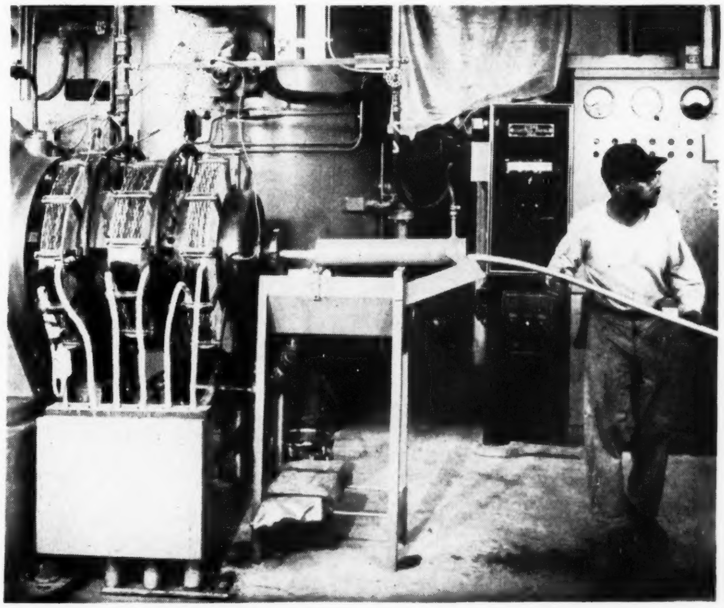
Quaker's Continuous Molded Hose Extruder

With the recent installation of a continuous lead extruder in its Philadelphia, Pa., plant, Quaker Rubber Division, H. K. Porter Co., Inc., is said to be the first rubber manufacturer in the East capable of producing continuous lengths of molded hose with uniform size and quality. Quaker Pioneer Works, Pittsburg, Calif., has been using this process successfully for a number of years.

Uniformity in size and quality of molded hose was virtually unattainable with the stroke-type or reciprocating method formerly used. The lead sheath produced by the stroke-type press introduced objectionable lead marks on the hose when the stroke or lead billet was changed. In many cases these marks had to be cut out, resulting in shortened lengths. This method also caused a considerable degree of variation in the diameter of the hose.

The continuous lead extrusion machine was designed and developed to eliminate the disadvantages of the stroke-type press and is a radical departure from the design of the hydraulic press. As the operation is continuous, any lengths of sheathing can be extruded without stopping the machine, which provides uniform lengths of hose. Since its introduction more than 20 years ago, this type machine has proved its reliability in the wire and cable industry, but Quaker is the first rubber manufacturer to adopt the process in the production of molded hose.

Advantages gained by continuous lead extrusions for molded hose are: freedom from stroke or billet change marks, more accurate size control, and longer lengths of hose. These advantages also will mean substantial savings to customers in the form of one-piece full-length reels. Prior to this method, distributors had to take one or more different lengths of hose to a reel.



Quaker Rubber's continuous hose extruder

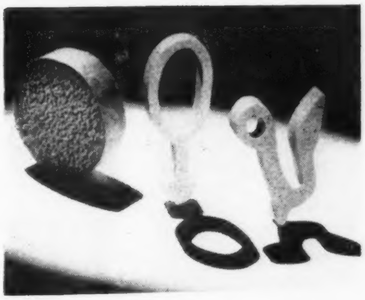
Stalwart Now Extrudes Silicone Sponge

Complex silicone sponge shapes now can be extruded and calendered by an exclusive technique perfected by the Stalwart Rubber Co., Cleveland, O. Stalwart can now supply extruded silicone sponge cross-sections in long lengths, continuous lengths, coils, and rolls. Sheets of silicone sponge measuring up to 36 inches in width can be produced by the calendering method. Calendered sheets can be combined with Orlon, Dacron, nylon, fiberglass, and other heat-resisting fabrics, according to the company.

Offering temperature resistance ranging from -160 to 500° F., Stalwart silicone sponge parts now enable manufacturers in the aircraft, electronics, appliance, machine tool, and other industries to employ superior and more versatile sponge parts while realizing important savings in production costs.

Silicone sponge provides unparalleled resistance to aging, sunlight, ozone, oils, and chemicals, plus excellent dielectric qualities at extremely high temperatures.

Lower equipment costs coupled with high-volume production economies in extruding and calendering silicone sponge provide customers with sharply reduced production costs. Costs of extrusion dies for silicone sponge sections are only a fraction of those for conventional steel or aluminum molds. Special dies for extruding silicone sponge can usually be developed by Stalwart engineers for less than $100.



Extruded silicone sponge

Density, cell size, and configuration are scientifically controlled by the company to produce sponge cross-sections to close dimensional tolerances that meet individual requirements. Stalwart's extruded and calendered silicone sponge complies with sponge standards established by The Rubber Manufacturers Association, Inc. Samples and complete information are available from the company.

Sheffield Demonstrates Thickness Gage

To assist producers and fabricators of films, strips, and foils to see how continuous thickness control can help lower production costs and improve quality, The Sheffield Corp., Dayton, O., a subsidiary of Bendix Aviation Corp., will provide on-the-job demonstrations of its Measuray non-contact X-ray thickness gage.

A standard-model Measuray gage consisting of the X-ray scanning unit and an electronic generator with built-in setting control is carried about the country in a station wagon. This device can be set up and be in operation on a producing or sorting line within an hour.

The new demonstration service is available without charge or obligation to producers and fabricators of plastic film, cellophane, rubber, paper, glass, foils, and thin metal strips such as copper, brass, steel, aluminum, and precious metals.

The gage features an ultra-fast gaging cycle enabling it to be used with high-speed electronic sorting and classifying devices, automatic strip thickness controls, recorders, and other accessories. Its low-intensity X-rays scan films and foils as thin as 0.0002-inch speeding by at rates up to 100 feet per second. Reservations for a Measuray demonstration can be made through the company's representatives.

Bakelite's Improved Rigid PVC's

Two new rigid polyvinyl chloride plastics, QGD-5020 for high-impact and QGD-5010 for extreme chemical resistance, which can be extruded twice as fast as conventional rigid PVC compounds, have been added to the list of vinyl plastic materials supplied by Bakelite Co., Division of Union Carbide Corp., New York, N. Y. These two materials, engineered particularly for pipe and contour extrusion applications, are available in commercial quantities and are priced at 42.5¢ per pound in truckload lots.

On slightly modified commercial equipment QGD-5020 and QGD-5010 compounds have run as high as 100% faster than competitive rigid PVC compounds and maintain better surface smoothness. Good gloss characteristics can also be obtained on contours and sheet for vacuum forming, according to the company.

Among the toughest of all plastics now marketed commercially, QGD-5020 in extruded form has a reported Izod impact strength measuring in the range of 20 to 30 pounds per inch of notch in tests conducted. Uses for the tougher PVC compound are expected to include the following fields: building—frames and channels, windows and storm sashes, gutters, exterior siding; electrical—high impact conduit; machinery—pneumatic tubing, tote boxes; consumer products—barrels for fountain pens and automatic pencils, cafeteria trays; and automotive—ducting.

A high degree of chemical inertness characterizes QGD-5010. It is said to be able to withstand contact with many strong acids, alkalies, metallic and ammonium salts, alcohols, and aliphatic hydrocarbons.

Additional information on these new rigid PVC compounds is available from the company.

Thiokol Expects Gain In Sales in '58

Thiokol Chemical Corp., Trenton, N. J., anticipates that sales of its chemical division, which produces specialized high-quality liquid polymers, will amount to about $9.5 million for 1958, an increase of approximately 30% over the 1957 total. The chemical division in recent years, while accounting for only perhaps one-quarter of sales, has been contributing close to 50% of net income. The recent acquisition of Reaction Motors, Inc., liquid-fuel rocket firm, would change this relation somewhat, but the chemical division expects to continue to be a very substantial contributor to net income.

Opportunities are opening up for Thiokol liquid polymers, already used extensively as sealants around windows and between stone or cement panels in large new commercial buildings. The material is now going into highway construction and is being used on bridges to cover steel pavement gratings against skidding.

Several states are studying the application of the material for bonding new cement surfaces on top of old ones for road construction. Other growing uses are in new commercial jet aircraft for sealing fuel tanks and lines and for pressure cabins. Not only is the material being employed in pipe-line construction to guard against leakage of contaminating materials, but the firm is working jointly with producers of epoxy resins on materials which can be used to manufacture fiber-glass pipe.

Thiokol is also engaged in research and development work in polyurethanes, of growing importance in insulation, containers for shipping, and in construction where sound absorption and vibration dampening are desirable factors.

Past chairman of the Connecticut Rubber Group, James R. Boyle, United Carbon Co. (*left*), receives lifetime membership card from present chairman, R. T. Zimmerman, (*center*). Looking on is another past chairman, Harry Gordon, Bond Rubber Corp., similary honored

NEWS BRIEFS

Pennsalt Chemicals Corp. has announced that its new plant for the manufacture of mono-, di-, and trimethylamines will go on stream this month at its Wyandotte, Mich., works. A sizable growing captive use was a primary factor behind the expansion. With the completion of this plant, Pennsalt, a major producer of organic nitrogen compounds, will be the only manufacturer of a complete line of the lower alkylamines from methyl through amyl. The new plant, for which ground was broken earlier this year, is being constructed by the Catalytic Construction Co., Philadelphia, Pa.

Dow Corning Corp., Midland, Mich., has announced price reductions on its Silastic LS-53 ranging from 10 to 12%, resulting in a quoted price of $22.00 a pound for 1,000 pounds or more. Silastic SL-53, a solvent-resistant rubber, is a heat-stable, molecular hybrid fluorocarbon silicone which combines the ease of fabrication of silicone rubber with the solvent resistance of fluorocarbon plastics. Parts fabricated from SL-53 have proved to be serviceable from below —80° F. to over 500° F., reports the company.

Great Lakes Carbon Corp.'s mining and mineral products division, Los Angeles, Calif., has become the sales agent in the United States and Canada for clay, talc, pyrophyllite, and other products of Huntley Industrial Minerals, Inc. Huntley, whose operations center around Bishop, Calif., owns and operates several deposits of high-grade, non-metallic minerals, principally kaolin clay, talc, and pyrophyllite. These products are now being used in the ceramics, insecticide, paper, paint, rubber, and glass industries.

B. F. Goodrich Tire Co., Akron, O., is now marketing four new sizes of ribbed tread tires for use on boat and utility trailers, bringing to six the number of sizes available with the ribbed tread design. The new sizes are a six-ply 4.80-8, a four-ply 4.80/4.00-12, a four-ply 5.70/5.00-8, and a six-ply 5.70/5.00-8. Added to the four-ply 4.80/4.00-8 and the six-ply 5.30/4.50-12, the new sizes round out the BFG boat trailer tire line. BFG ribbed pneumatic tires have extra-wide level treads for long wear and smooth ribs, with deep grooves, for less sway on curves, according to the company.

The Dayton Rubber Co., Dayton, O., has announced the development of special ozone-resisting compounds for oxygen hose and of stepped up production facilities. Meeting latest military specifications (MIL-H-5581, MIL-T-7138, and MIL-T-7025), the new ozone-resisting compounds obsolete the standard stockette construction. Elimination of the fabric cover gives this new hose a thousand times greater resistance to abrasion and offers visual inspection at all times. The firms Waynesville, N. C., plant has been turning out the new hose in quantity for military applications. Expanded technical, testing, and servicing facilities in this area are expected to make the new development available for a wide variety of commercial applications requiring inhalation tubing.

The B. F. Goodrich Co.—Flooring Products, Watertown, Mass., was the first company to utilize the newly coordinated Flexi-Van rail-highway service of the New York Central Railroad to ship a load of floor tile to St. Louis, Mo., from Boston, Mass. Flexi-Van operations follow a simple three-step technique. The loaded trailer is driven over the highway to a train yard where the van is placed next to a rail flat car. The trailer is backed to a flat car, gliding off its own wheels on to a specially constructed hydraulic turntable built into the rail car. The Flexi-Van is then swung into position on the rail flat car by one man, usually the truck driver.

Tote System, Inc., Beatrice, Neb., manufacturer of bulk material handling equipment, has started a new trial rental program for Tote Bins and Tilts. Under the program, standard aluminum Tote Bins in stock sizes — 42-, 74-, 90-, 98-, and 100-cubic-foot capacities —and Tote Tilts, discharge mechanisms for the Bins, are available for trial periods, on a rental basis instead of sale. This policy enables a user actually to test the Tote System in his own operation, handling the material that he wishes to handle on a small pilot-type of movement. Rental charges vary with type of Bin and Tilt desired.

"Alpargatas," the world's largest shoe manufacturing enterprise in Argentina, has an average daily production of more than 230,000 pairs. Two and a half years ago the firm was one of the first affiliates of Wellco-Ro-Search, Waynesville, N. C., to begin manufacturing vulcanized leather shoes under "Process 82" on a licensee basis. Currently, its most rapid growth centers around "Process 82" footwear in various categories, producing several thousand pairs daily. Recently "Alpargatas" advertised its "Process 82" shoes in full-color pages in the Latin-American edition of *Reader's Digest,* as well as in other Latin-American publications.

United States Rubber Co., New York, N. Y., has appointed Champion, Inc., Iron Mountain, Mich., distributor of its industrial rubber products including conveyor belting, transmission belting, rod and sheet packing, a wide range of hose, and other industrial products. Founded 37 years ago as a supplier of gravel, Champion has expanded its operations to cover the construction field both as supplier and contractor. It will distribute the rubber company's products in the northern Michigan peninsula area.

The Electric Auto-Lite Co., Toledo, O., has started its new program to extend special research, engineering and production skills and facilities of its general products group to the electronics and electrical industries. Centered on the recently completed Auto-Lite wire and cable research and processing laboratories that have been approved by the Air Force for research and development work, the new program also coordinates the 19 Auto-Lite engineering laboratories for project research and development to expedite solutions to customer cost and performance requirements.

Thiokol Chemical Corp., Trenton, N. J., reports that all its research and development facilities have been assigned to work on the three-stage propulsion system for the Air Force's "Minuteman," solid propellant, land based, intercontinental ballistic missile. While most of the work on the program will be conducted at Thiokol's 11,000-acre plant at Brigham City, Utah, research on "Minuteman," together with other programs, provides satisfactory work loads for all rocket divisions with research and development facilities — Elkton Reaction Motors and Redstone.

Beebe Rubber Co., Nashua, N. H., recently broke ground for its new addition to its administrative building which will connect the present office building with the main plant. The new structure, a single story having 3,000 square feet of floor space, is the fourth expansion for the rubber firm in the past two years. This new addition will permit the firm to consolidate its production, sales, and billing offices in one compact unit. It is expected to increase efficiency and to aid in expediting orders.

The Goodyear Tire & Rubber Co., Akron, O., has recalled approximately 700 employes to the payrolls of its plants throughout the country. It was also announced that the average hours worked per week company-wide had increased substantially. A leveling out of business conditions and a slight upturn in orders have brightened the economic picture, the firm reported.

Amoco Chemicals Corp., Chicago, Ill., effective July 28, started soliciting business on phthalic anhydride at a price of 17¢ per pound, f.o.b. plant, freight equalized. Isophthalic acid will be offered at the same time and under the same terms and conditions at a mol equivalent price of 15.2¢ per pound when the company's new plant at Joliet, Ill, comes on-stream about November 1. Isophthalic acid, made from a different raw material by a different process, previously commanded an appreciable premium over phthalic anhydride. Both chemicals are used in the manufacture of paints, plasticizers for vinyl resins and reinforced plastics.

Monsanto Chemical Co. has inaugurated custom blending of plasticizers in bulk quantities in newly completed facilities at Long Beach, Calif. It will make any feasible blend of its plasticizers if the order is in tank-wagon quantity. Monsanto markets more than 75 different plasticizers. The blends are priced at the composite bulk price of their ingredients. Advantages offered by the custom blending service include: no weighing or blending operations for customers, simplified ordering and inventorying, one-tank storage, and producer responsibility for the quality and uniformity of the blends. Custom blended plasticizers also are available from Monsanto's plants at Everett, Mass., and St. Louis, Mo.

American Viscose Corp., Philadelphia, Pa., plans to discontinue operations at its plant in Roanoke, Va. An orderly curtailment of manufacturing is being planned to be effective as soon as practical. No specific dates have been established. A plan for the termination of the plant's 1,750 employes is also being studied. The Roanoke plant started operations in the Fall of 1917 to manufacture continuous filament yarns used in apparel and decorative fabrics. The overall effect of the Roanoke shutdown will be to consolidate productive capacity. No decision has been made as to ultimate disposition of the plant property, the company stated.

B. F. Goodrich Tire Co. will start construction of a factory warehouse addition to its Miami, Okla., tire plant in October. The new building, the fifth major expansion of the Miami plant since February, 1945, will provide 214,000 square feet of floor space in a building 500 by 420 feet. The Miami plant in October, 1957, began production of large off-the-road tires, weighing up to 3,000 pounds for use in highway and airport construction, and in reclamation projects. The Oklahoma tire plant currently employs more than 1,400 and is one of five Goodrich tire plants in the United States.

News Briefs

Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., was sold recently to Textron, Inc., and this sale has given rise to a misunderstanding that the concern involved is Farrel-Birmingham Co., Inc., of Ansonia, Conn. Farrel-Birmingham wants to clarify that there is no corporate relation between the two companies, or has there been since 1880. Farrel-Birmingham is an independent manufacturer of heavy machinery, and will continue to serve the many industries that it has in the past.

The Society of the Plastics Industry, Inc.'s division, the Plastic Bottle & Tube Manufacturers' Institute, New York, N. Y., reported that 113 million plastic bottles and tubes were sold during the first quarter of 1958. This sale represents a 10.4% increase over the 102 million units sold in the first quarter of 1957. Up to the present time, the largest volume of these containers has been represented by small-size bottles and tubes used by the cosmetic and pharmaceutical industries. The present trend indicates that the use of large-size containers manufactured primarily from polyethylene is on the increase.

The B. F. Goodrich Co., Footwear Products, and Hood Footwear Products, have moved their Boston branch office and warehouse to larger quarters at 139 Cypress St., Watertown, Mass., according to C. W. Karshick, Goodrich district sales manager, and Wm. T. Jackson, Hood district sales and branch manager.

Gulf Oil Corp., Pittsburgh, Pa., has announced a new industrial grease, Gulfcrown Grease E. P., developed especially to be used in bearing applications where high pressures and shock loads exist, as in Banbury mixers. The new grease has residual anti-weld properties and adhesive characteristics that also make it ideal for applications where infrequent greasing is practiced. The grease is said to have excellent water resistance and good pumpability to below freezing. It will also serve the needs of industry at elevated temperatures.

Parker Seal Co., division of Parker-Hannifin Corp., Cleveland, O., is now offering O-rings and other seals, molded from a new Viton A base material for service with jet fuel and synthetic engine and hydraulic oils at very high temperatures. The new material, designated Parker compound number 77-545, was formulated to meet rigid requirements such as enumerated in USAF specification MIL-R-25897. The compound can withstand long-term use at 500° F. in compatible fluids and has life of some hours even at 600°, according to the company. It is said to be suitable for static seals at —40° F.

The General Tire & Rubber Co., Akron, O., will award 20 college scholarships to boys and girls who give the best answers to what can be done to assure greater highway safety in the United States. A first prize scholarship of $1,000 to the college of the winner's choice will be awarded for the best answer, $900 for the second best, and $850 for the third best. The remaining prizes will range from $800 to $200. Rules of the contest specify that each candidate write 250 words or less. Students are eligible if they are attending high school or an accredited college anywhere in the United States, except children of employes of General Tire. Entries are being accepted from August 15 to December 1, 1958. Winners will be notified by mail on or before January 1, 1959.

B. F. Goodrich Co.—Flooring Products, Watertown, Mass., has moved its Boston office to 176 Federal St., Room 502, Boston, Mass. Arthur L. Mullin sales representative for Hood flooring products, is headquartering at this new address. Goodrich Flooring also announced the opening of new headquarters at Richmond, Va. Joseph W. Malloy, district sales manager, southeastern district, has transferred to the new office at Dabney Rd. and Clay St. P. O. Box 6695, Richmond, Va.

Chas. L. Huisking & Co., Inc., New York, N. Y., a leading merchandiser and manufacturer of raw materials for the pharmaceutical industries, has acquired the assets of Glyco Products, Inc., New York, N. Y., producer of chemicals for the food, plastics, paper, electronics, metals, print, and textile industries. The transfer officially took place August 22. All assets of Glyco acquired by Huisking will be formed into a new corporation, Glyco Chemicals Corp., as a manufacturing and sales subsidiary. The new subsidiary will continue to produce and market emulsifiers and stabilizers for the food industry, and synthetic waxes and emulsifiers for the adhesive, surface coating, plastic, textile, metal, and rubber industries.

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., is supplying the Hypalon synthetic rubber base being used in paints by a number of paint and coatings manufacturers. Recently developed paint made with a base of Hypalon has been applied to the canvas decking of boats. In one instance where the canvas surfaces of a boat were painted, they have withstood three seasons of continuous exposure to sunlight and salt water without signs of cracking, checking, or discoloration. Of particular importance in Hypalon's use as a base for marine finishes is its ability to withstand sunlight, weather, oil, salt, and other chemicals and abrasion. Also, it cleans readily with soap and water.

Marbon Chemical, division of Borg-Warner, has announced that its general sales office, research laboratories, and general administrative departments are located in a new administrative center constructed as part of the new Woodmar plant at Washington, W. Va. Production units will operate at Gary, Ind., and Washington, W. Va. The new address is Box 68, Washington, W. Va., and the telephone is GArfield 2-5401.

B. F. Goodrich Chemical Co., Cleveland, O., has announced its first customer delivery of polyvinyl chloride resin in an Airslide railroad car specifically designed for volume bulk shipments. The car shipment of Geon vinyl resin was delivered to the new chemical products plant of the Ford Motor Co. in Mt. Clemens, Mich. The Airslide car was developed by General American Transportation Corp. Customers utilizing this method are able to realize substantial savings in labor and time at the point of delivery. Products delivered by Airslide are reported to be completely free from contamination.

Yale Rubber Mfg. Co., Sandusky, Mich., has announced that all outstanding stock of an affiliated concern, Yale Rubber Mfg. Co. of Canada, Ltd., was sold by individual stockholders to Garlock Packing Co., Palmyra, N. Y. The ill health of L. F. Runciman, president and founder of the Canadian concern, made it impractical to continue operation.

B. F. Goodrich Aviation Products Co., Akron, O., has developed a new type of aircraft tire which is said to outperform and outwear any other jet tire. The new tire, designated the 30-8.8 Fabric Tread tire, with dimpled tread design, will be standard equipment on Convair's F-106 Delta Dart. The BFG Fabric Tread tire has been reported to outlast other jet tires five to one.

Instrument Society of America is sponsoring a meeting, National Rubber & Plastics Instrumentation Symposium, to be held in Akron, O., October 20-21. For information regarding the program write to Dr. D. R. Davis, The General Tire & Rubber Co., Akron, O.

Great American Industries, Inc., Rubatex Division, Bedford, Va., has appointed Dan Lewis, Inc., 43 Park St., Dover, N. H., distributor for Rubatex firm crepe soling in New Hampshire, Connecticut, Massachusetts, Vermont, and Maine. This soling is a closed cellular rubber material which is impervious to moisture, light in weight, and resistant to abrasion. Dan Lewis, Inc., will warehouse and distribute the material in a variety of colors.

Kessler Chemical Co., Inc., Philadelphia, Pa., pioneer in the development of industrial organic esters, is now in production in its second manufacturing plant at Cottman Ave. and State Road. According to W. B. Pings, general manager, this new facility doubles plant capacity and provides improved production units for glycerol monostearate, synthetic waxes, surface active agents, and various other fatty acid derivatives.

American Viscose Corp., Philadelphia, Pa., recently reorganized its fibers division sales. Malcolm V. Macfarlan, formerly sales manager for the rayon division, has been named sales manager for the fibers division; while Norman A. Cocke, Jr., formerly manager of rayon textile filament yarn sales, has been appointed sales manager for all rayon fibers except tire yarn. Charles J. Mills continues as manager of acetate sales, and Frank T. Williams as manager of rayon tire yarn sales. John C. Wilmerding, formerly manager of rayon staple sales, has been named a staff assistant to Macfarlan to handle special assignments. By combining rayon textile filament and rayon staple sales under one man, the organization is being streamlined to offer better services to all customers.

United States Rubber Co., New York, N. Y., recently developed a new system of freight car packing, utilizing air walls, which promises to cut down transit damage in box cars, particularly in those carrying partial loads. Called the pressure bulkhead method, the system was recently demonstrated before shipping officials by its developer, Homer H. Dasey, of Oakmont, Pa. The method affords easy conversion of any box car to one with compartments. Its chief features are the U. S. Rubber air walls—a variation of the company's Shor-Kwik inflatable dunnage bags; steel mesh bulkheads; and a low-pressure air line running through the length of the car. The bulkheads are moved on tracks, and the air-pressure system automatically keeps the bulkheads inflated at a preset level. Voids that accumulate in transit are thus taken up by expansion of the air walls.

Mansfield Rubber (Canada), Ltd., celebrated at its tire plant in Barrie, Ont., the production of its millionth tire with a ceremony on August 14 attended by some 300 friends and guests from allied business and industry. The celebration also marked the official opening of an additional 30,000 square feet of industrial factory space at the three-year-old plant, bringing the total area for manufacturing to nearly 100,000 square feet. Lee T. Rosser, president of the firm, in his address stressed that the achievements of the three years were due mainly to constructive business cooperation between Canada and the United States.

Polymer Corp., Ltd., Sarnia, Ont., Canada, has disclosed that engineering development work has been undertaken on a new storage warehouse for its synthetic rubber. To finalize construction details and costs various suppliers and construction companies will be consulted. Contracts are expected to be awarded so that construction may commence this fall. The warehouse, to provide in excess of 150,000 square feet of space, will be located at Scott and Churchill roads. Polymer requires greater storage facilities in order to provide prompt shipment to customers under present competition, as well as to allow more efficient plant production schedules, according to the firm. The increasing number and varieties of grades and types of Polymer rubbers also necessitate more storage space.

Military Clothing & Textile Supply Agency, Philadelphia Quartermaster Depot, U. S. Army, Philadelphia, Pa., has made one award on invitation for bids QM 36-243-59-16, covering gloves, rubber, men's, electrical workers, to Charleston Rubber Co., Charleston, S. C., for 5,013 pairs, at $5.92 each, for a dollar value of $29,676.96, and one award also has been made on invitation for bids QM 36-243-59-21, covering gloves, rubber, men's, to The Pioneer Rubber Co., Willard, O., for 33,021 pairs, at $1.00-1.063 each, for a dollar value of $33,618.20. An award was also made to the Pawling Rubber Corp., Pawling, N. Y., for 375,000, support crowns, service cap, rubber, at $0.1064 each, for a dollar value of $39,900.00.

B. F. Goodrich Industrial Products Co., Akron, O., has developed rubber springs which are being used on the Navy's newest and largest amphibious cargo carrier, the LVTUX2. About 1,100 pounds of resilient rubber suspend the 300,500-pound loaded weight of the tracked landing craft. In the unique system, called Torsilastic rubber springs system, individual rubber springs cushion each of 32 bogie wheels. About 9,400 pounds of sprung weight are supported by the 36 pounds of rubber used in each spring. The new cargo carrier was designed and built by Pacific Car & Foundry Co., Renton, Wash. Goodrich, the only manufacturer of Torsilastic springs, furnished more than half a million of the rubber springs during World War II for use on LTV's.

B. F. Goodrich Chemical Co. has announced that production is now under way at its newly completed Good-rite glacial acrylic acid plant in Calvert City, Ky. The unit, with an annual capacity of several million pounds, is said to be the first in this country to bring glacial acrylic acid into quantity production. Use of this versatile, highly reactive monomer in small quantities imparts increased adhesion and curability to many resinous and plastic materials, according to the firm. When polymerized alone or as the major ingredient with other monomers, it results in water-soluble resins with a wide range of useful properties. These resins are used as textile sizes, sand core binders, latex thickeners, and flocculating agents.

NEWS about PEOPLE

J. W. Gilroy has been assigned to the newly created post of export sales manager, for Jefferson Chemical Co., Inc., headquartering in New York, N. Y. He will be responsible for administration, planning, and direct sales activities in foreign markets and will report to **P. R. Monaghan,** eastern regional manager. Gilroy had been with the company's marketing department since 1951.

Leonard C. Strobeck, since 1948 vice president in charge of mechanical goods sales for The Dayton Rubber Co., Dayton, O., recently retired after 29 years of service. He will establish offices in Dallas, Tex., where he will continue to do special staff and sales development work for Dayton. **Robert G. Burson** has been appointed general sales manager of the mechanical goods division of the company, succeeding Strobeck. The former now assumes responsibility for marketing all types of V-belts, hose, and allied products for the automotive, railway, agricultural, and industrial fields in both original equipment and replacement markets. He joined Dayton Rubber in 1956 as sales manager of the industrial V-belt division.

Fabian Bachrach

Donald Simonds

Maarten Voogd, manager of Shell Chemical Corp's Torrance, Calif., rubber plant and in past years active in the establishment and growth of the company's other San Francisco Bay area and Southern California manufacturing facilities, will retire at the end of this year. Voogd will go abroad in mid-October on a special assignment for Shell following which he plans to move to Ojai, Calif., and establish offices as a manufacturing consultant. He has served as manager of the Torrance rubber plant—the West's only large-scale synthetic rubber installation —since 1955 when Shell Chemical purchased the facilities from the government.

Duane R. Branaka has been named sales manager of Valvair Corp., Akron, O., and will supervise sales of the Valvair manual and pilot-operated control valves. He was previously with the Celanese Corp. of America.

Duane R. Branaka

Owen J. Brown, Jr., vice president and director of sales for Godfrey L. Cabot, Inc., Boston, Mass., chemicals manufacturing firm, has announced the opening of a new Cabot sales office in Los Angeles, Calif., scheduled for January 1, 1959. The following organizational changes are effective on that date. **Donald Simonds,** midwestern regional sales manager, will assume the newly created post of western regional sales manager, with headquarters in Los Angeles. **Daniel B. Doherty** will replace Simonds as midwestern regional sales manager, with headquarters in Akron, O.; while **Francis H. H. Browning** will succeed Doherty in New York, N. Y., as eastern regional sales manager.

Fabian Bachrach

Francis H. H. Browning

O. E. Isenburg, since May, 1954, general manager of the Harmon Colors division of B. F. Goodrich Chemical Co., Haledon, N. J., has been elected president of the Dry Colors Manufacturers' Association. He was vice president for the past two years. Twenty-seven producers of organic and inorganic color pigments are represented in the Association. Mr. Isenburg started with The B. F. Goodrich Co. in 1941 on the sales staff and in 1944 was transferred to Goodrich Chemical, where he held various technical and sales positions before becoming field sales manager for plastic materials in 1949. In 1953 he was made sales manager for Harmon Colors.

Sam I. Roudebush, resident manager of Productos de Caucho Villegas, S. A., an affiliate company of Seiberling Rubber Co. in Bogota, Colombia, returns to company headquarters in Akron, O., to fill the position of production coordinator. **John M. Swarts,** formerly technical director at the Bogota plant, is its new resident plant manager.

Fabian Bachrach

Daniel B. Doherty

Charles W. Erickson, formerly merchandising manager and district sales manager of Continental Can Co.'s plastic container division, has joined Borden Chemical Co., New York, N. Y., as asistant sales manager of the Resinite department. He will be responsible for the development of new product sales, including vinyl tubing used in the dairy, food, and beverage fields. He will also handle merchandising and sales promotion activities for the department's other industrial products.

R. S. Earhart has been appointed manager of The Goodyear Tire & Rubber Co.'s International Corp. chemical division, Akron, O. Former assistant general sales manager of the company's domestic chemical division, Earhart has been acting manager of the International group since June, 1957. He replaces **R. E. Workman,** recently appointed assistant general manager of the chemical division.

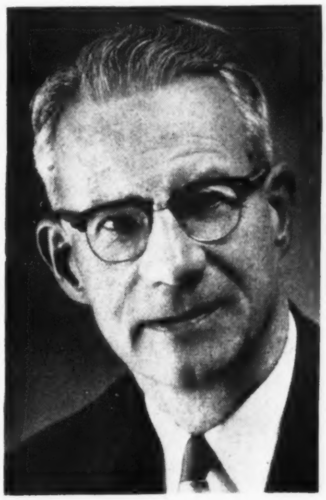
R. S. Earhart

William A. Suiter

D. M. Pratt, with Marbon Chemical, division of Borg-Warner, Gary, Ind., since 1934, becomes sales manager in charge of an expanded sales program for rubber reinforcing resins, paint resins, and Ty-Ply adhesive products. **William A. Suiter,** who recently joined the Marbon organization, has been appointed sales manager for Cycolac, a thermoplastic resin. Pratt and Suiter will headquarter at Marbon's new administrative and research facilities located in Washington, W. Va.

D. M. Pratt

Leon W. Miller has been named director of chemical sales for Plastics & Coal Chemicals Division, Allied Chemical Corp., New York, N. Y. Miller's entire business life of more than 42 years has been spent with the Barrett Division, from which the new Plastics & Coal Chemicals Division was recently formed. Joining Barrett in 1916, he was transferred to New York in 1930 and became sales manager, specialties department, and shortly thereafter manager of chemical sales.



Leon W. Miller

Frank E. Critchfield and **Lloyd H. Wartman** have been appointed group leaders in the development department of Union Carbide Chemicals Co., division of Union Carbide Corp., at South Charleston, W. Va. Dr. Critchfield will be in charge of development work on chemical methods of analysis. Wartman will head product development work on polyolefins. Also, **R. E. Fryer** and **A. M. Gross,** two chemical engineers were transferred from Bakelite Co. to the development department of Union Carbide Chemicals Co.

Wesley M. Graff, manager, safety, health, and fire prevention for the United States Rubber Co., New York, N. Y., has been appointed chairman of the American Standards Association Sectional Committee B28, New York, N. Y. Sectional Committee B28 is concerned with the development of a safety code for rubber machinery.

Herbert R. Jordan has been promoted to eastern regional sales manager, tire, battery and accessory sales, The General Tire & Rubber Co., Akron, O. In his new position he will have supervision over TBA sales in the company's Boston, Mass., Charlotte, N. C., New York, N. Y., and Philadelphia, Pa., sales divisions.

Joseph B. Hall, president of Kroger Co., Cincinnati, O., has been elected a director of The Goodyear Tire & Rubber Co., Akron, O. Hall succeeds **B. A. Polsky,** Akron department store pioneer and civic leader, who resigned after 11 years' membership on the Goodyear board.

William H. Schloenbach

John C. Young, formerly of Dow Chemical Co., has joined the Borden Chemical Co.'s Polyco-Monomer department as technical sales representative in the Ohio area, making his headquarters in Cleveland, O. He assumed his new responsibilities following a training program at Borden's laboratories in Leominster, Mass.

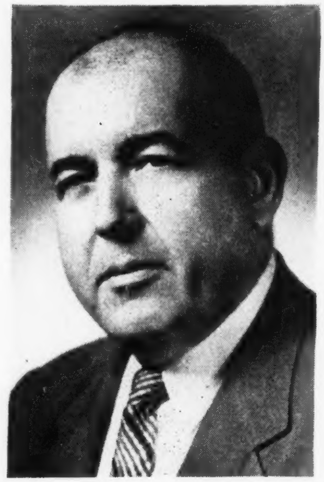
William H. Schloenbach, formerly a product engineer in the Hycar nitrile rubber sales department, has been appointed a sales representative for B. F. Goodrich Chemical Co., Cleveland. He will make his headquarters in Schenectady, N. Y. Also, **Grover S. Ramsey** has been assigned as sales representative in Michigan for Hycar nitrile rubber and rubber chemical sales, headquartering in Detroit, Mich. The new sales territory was created principally to give better service to the automotive industry.

Grover S. Ramsey

News about People

Edward G. Frey

Warren S. McKay has been elected secretary of United Engineering & Foundry Co., Pittsburgh, Pa. Employed by the company since 1942, he was most recently assistant treasurer. He is also currently assistant treasurer of United's subsidiaries, Adamson United Co., Akron, O., and Stedman Foundry & Machine Co., Inc., Aurora, Ind. At the same time the board of directors elected **Edward G. Frey** as assistant treasurer of United. He has been with the company since 1942; his most recent position was general accountant.



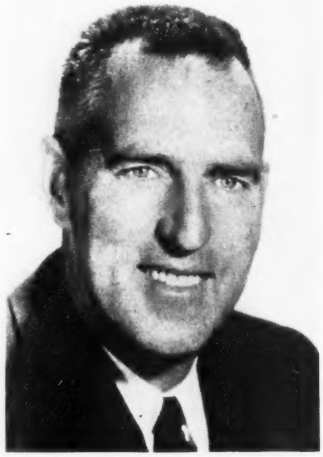
Warren S. McKay

Harold W. Burkett, treasurer, U. S. Rubber Reclaiming Co., Inc., Buffalo, N. Y., has been elected vice president of the Buffalo Control of the Controllers Institute of America, New York, N. Y. The following have been elected directors of Institute of America, New York, N. Y. The following have been elected directors of Institute local Controls in their respective areas: **Wayne E. Burger**, treasurer, Goshen Rubber Co., Inc., Goshen, Ind., (Michiana Control); **Bruce E. Esterly**, vice-president and controller, Cooper Tire & Rubber Co., Findlay, O. (Toledo Control); **William E. Flack,** controller, Acushnet Process Co., New Bedford, Mass. (Boston Control); and **E. Pennington Meyer,** assistant controller, Hewitt-Robins Inc., Stamford, Conn. (Bridgeport Control).

Christy Reggie, well-known shoe stylist, has resumed his position as shoe consultant and technician at the Wellco - Ro - Search headquarters in Waynesville, N. C. Reggie, Wellco Shoe Corp.'s first employe, returns after an absence of nine years. Prior to his return he was stylist for Sun-Cal Shoe Co. Inc., Los Angeles, Calif.

John McShain has been elected a director of Lee Rubber & Tire Corp., Conshohocken, Pa. McShain, president of John McShain, Inc., is a nationally known building contractor, with headquarters in Philadelphia, Pa.

Judson T. Barber, Jr., Ray D. Garlington, Kenneth L. Clark, and **David M. Stewart,** all chemical engineers, recently joined Columbia-Southern Chemical Corp. at its Corpus Christi, Tex., plant. Also joining this operation were **E. Phelps Helvenston,** research chemist; **Judith K. Harper,** chemist; and **Ronald Wackwitz,** physicist.



G. S. Williamson

G. S. Williamson, manager of Shell Chemical Corp.'s ammonia plant at Pittsburg, Calif., has been appointed manager of the company's synthetic rubber plant at Torrance, Calif. He succeeds **Maarten Voogd,** who will retire at year-end after 29 years with Shell. **Frank G. Watson,** assistant manager of the company's manufacturing development department, New York, N. Y., will succeed Williamson as manager at Pittsburg.

Norfleet M. Gibbs has joined the southern sales staff of fiber sales and service, National Aniline Division, Allied Chemical Corp., New York, N. Y. With headquarters at Greensboro, N. C., he will service mill accounts on sales of Caprolan polyamide staple and filament yarns.

William R. Haas has been appointed director of marketing for Monsanto Chemical Co.'s overseas division, St. Louis, Mo. Haas, formerly director of sales for the division, replaces **S. C. Finnel Jr.,** who resigned to accept a position with another firm. **Norman E. Horton,** assistant director of sales, St. Louis, succeeds Haas as director of sales; while **Robert L. Vincent,** managing director of Monsanto Japan, Ltd., Tokyo, succeeds Horton.

E. K. Harter has been elected a vice president of The Garlock Packing Co., Palmyra, N. Y., world's largest producer of packing materials. His title will be vice president-personnel. He joined the company in 1943 and has served successively as personnel manager, director of industrial relations and director of personnel.

Dennis J. Killian, Jr., has been promoted to supervisor, semi-works plant, at Pittsburgh Coke & Chemical Co., Pittsburgh, Pa. He joined Picco in 1950 as a chemist in the research department. He later served as chemical engineer and assistant supervisor, plasticizer plant; assistant to the superintendent, industrial chemicals division; and most recently as chemical production staff assistant.

Alan J. Woodfield has been named executive vice president of Sealol Corp., Providence. R. I. Woodfield, formerly vice president and general manager of LaFavorite Rubber Co. and prior to that a vice president of Continental Paper Co., joined Sealol last fall as controller. He will continue to serve in this capacity.

Richard K. Mattocks has been named sales manager of Minnesota Rubber Co., Minneapolis, Minn. In his capacity as assistant to the vice president for sales, he will have direct responsibility for administering sales in the Midwest. He became associated with the company in January, 1956, as assistant sales manager.

Harold L. Wolfsperger has been appointed manager of The Goodyear Tire & Rubber Co.'s retread plant at Akron, O. Starting with the company in 1925, he has been with the retreading and equipment sales division since 1954.

William H. McConnell

William H. McConnell, vice president-sales since 1953 and a veteran of 30 years' service in sales work with Diamond Alkali Co., Cleveland, O., now is vice president-marketing. **Henry B. Clark**, general manager of Diamond's soda products divison, has been named director of sales, a newly created position. **John W. Mantz**, general manager of the silicate, detergent, calcium division since its formation in June, 1954, has been made general manager of the soda products division; while **Samuel S. Savage**, director of export sales for Diamond for the past nine years, has become general manager of the company's new international division.

Henry B. Clark

Oliver Hayden, who is retiring from the elastomer chemicals department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., in the near future, was made an honorary member of Committee D-11 on Rubber of the American Society for Testing Materials at special surprise ceremonies at the meeting of Committee D-11 in Boston, Mass., on June 26. Mr. Hayden, a former chairman of Committee D-11, was instrumental in the work which led to the improvement of the standards for rubber products for automobiles, the work being done by a joint committee of the Society of Automotive Engineers and ASTM.

Oliver Hayden

Ronald J. Ohm has joined the zinc oxide sales staff of American Zinc Sales Co. in the Indiana-Ohio-Pennsylvania area. He has been assigned to central district of the company, with headquarters in Columbus, O. He was previously with Dow Corning Corp. in Cleveland, O., where he served in research and development, and in sales service work since 1953. His past experience includes development work of emulsions, paint and silicone rubber fabrication.

Lee F. Church has been promoted to the newly created position of controller, and **Robert A. Behrmann**, to director of purchases and traffic, for Emery Industries, Inc., Cincinnati, O. Church has been with Emery since 1948 as director of market research. In his new position he will have direction of market research, sales analysis, budget control, and cost accounting operations. Behrmann has been Emery's director of purchasing since 1954, having joined the firm in 1948. He now assumes the additional supervision of Emery's traffic operation and all purchasing activities of the recently acquired Volcolene division in Los Angeles, Calif.

N. Y. Times

Charles A. Polachi

Charles A. Polachi has been elected president of Columbian Carbon International, Inc., New York, N. Y. He was previously a vice president and director of the company, and will continue to serve as a director. Polachi joined Columbian in 1955 as foreign sales manager after a number of years with Binney & Smith Co.

Leon R. Noe, Jr., has been appointed advertising manager of the *SPE Journal*, the official publication of the Society of Plastics Engineers, Inc., Stamford, Conn. He will be responsible for all advertising, sales promotion, and the establishment of regional publisher's representatives for the monthly Journal. He was previously associated with *Plastics Technology* as eastern sales manager and also with RUBBER WORLD as eastern sales representative. From 1952 until 1956 he had worked for the plastics division of Celanese Corp. of America in technical sales.

E. T. Cuddeback has been appointed manager, general products division sales, southeast region, for Allis-Chalmers Mfg. Co., Milwaukee, Wis. He will maintain his headquarters in the firm's regional offices in Atlanta, Ga. In his new position he is responsible for the promotion, planning, and coordination of sales through the district offices, for Allis-Chalmers motors, pumps, and motor controls, and Texrope drives.

Floyd C. Snyder has been named chairman of the board of directors, a newly created position, for Ace Rubber Products, Inc., Akron, O. He founded the firm and was its president since 1935. New president of the firm is the founder's son, **Charles J. Snyder**, who was previously executive vice president and will continue his activity as general manager. Also, **C. N. Jenkins** was named vice president in charge of sales, and **Robert N. Turgeon** was appointed secretary-treasurer of the company.

News about People

Albert L. Rhoton has been appointed vice president in charge of technical services at the Keokuk, Iowa, plant for Dryden Rubber Division, Sheller Mfg. Corp. He joined the Dryden division in April, 1953, as director of research and became technical director in November, 1957.

Kenneth H. Wirth has joined the technical staff of Copolymer Rubber & Chemical Corp., Baton Rouge, La., as development laboratory supervisor. Previously he was associate laboratory director of the St. Clair Rubber Co., Marysville, Mich. In his new position his years of rubber compounding and practical factory experience will serve as an invaluable aid to Copolymer customers who call on him for assistance in handling their special problems.

OBITUARIES

Wilbur S. Daley

Wilbur Stephen Daley, automotive sales manager for the Sponge Products Division of The B. F. Goodrich Co., Shelton, Conn., died recently in Shelton following an extended illness. He was employed for 24 years as automotive sales manager for the division.

Mr. Daley was born in Peabody, Mass., in 1901, and was educated in Peabody and Hamilton, Mass., school systems. He was a graduate of Dartmouth College in 1924 and received his degree of Master of English from Harvard University in 1925. He was an instructor in Canterbury School in New Milford before going to Shelton 24 years ago.

Mr. Daley was also very active in civic affairs, especially in the Derby-Shelton area.

A Solemn High Requiem Mass was sung in St. Joseph's Church, followed by interment in Riverside Cemetery.

Surviving are the widow, a son, a daughter, and five brothers.

Raymond L. Lasser

Charles Mayer Studios

Raymond L. Lasser

Raymond L. Lasser, vice president and director of The Harwick Standard Chemical Co., Akron, O., died of a heart condition at his home in Akron on August 10. He was also president and a director of Republic Dye & Chemical Co., Akron. Besides he was a member of the Division of Rubber Chemistry, American Chemical Society, and of its 25-Year Club.

Mr. Lasser was born in Barryville, N. Y., on May 13, 1893. Following graduation from high school he attended Reilly Business School in Binghamton, N. Y. After having launched his own business, the deceased joined Endicott Johnson Corp., Johnson City, N. Y., in 1918. He was superintendent of its rubber division when he resigned to join with Curtis J. Harwick in the chemical business in Akron in 1944. In 1948 he became a director and vice president of Harwick Standard Chemical Co.

Mr. Lasser also belonged to the West Congregational Church of Akron, Akron Art Institute, and the Akron City Executives and Congress Lake Clubs.

Services for Mr. Lasser were held in Akron on August 13, and interment was at Akron's Rose Hill Park.

He is survived by his wife, a son, a sister, and two grandchildren.

Ray R. Semler

Ray R. Semler, a director of Midwest Rubber Reclaiming Co., East St. Louis, Ill., and manager of its Barberton, O., operations, passed away on July 9 at Akron, O., after a brief illness. He was born July 4, 1901, and was employed by the Akron Rubber Reclaiming Co. on September 1, 1926. Previously he had spent six years with the Faultless Rubber Co., Ashland, O.

Early in his Midwest employment he was associated with S. G. Luther in the design and construction of the East St. Louis plant, becoming master mechanic when the plant went into operation in 1928. Semler became manager of the Barberton plant when operations were resumed there in the mid-thirties and, in addition, he served as chief engineer for the company for a period of several years preceding 1953. Semler was elected to membership on the company's board of directors in the year 1938.

Surviving are his widow and two sons.

Wilson J. Kite, Jr.

Wilson J. Kite, Jr., 65, purchasing agent of chemicals and miscellaneous commodities for plastics and coal chemicals division, Allied Chemical Corp., New York, N. Y., died suddenly, August 22.

A veteran of 52 years with Allied, he began his business career in Philadelphia in 1906, serving in various plant capacities, and was transferred to the company's New York office as a buyer in 1922. For the past several years he had acted as purchasing agent for Barrett Division, from which the new plastics and coal chemicals division was recently formed.

The deceased belonged to the Purchasing Agents Association of New York and the American, Pennsylvania, and Southeastern Gas associations. He also was a Master in the Guild of Ancient Supplers.

Mr. Kite leaves his wife and a son.

Services were held August 25 in the Gray Funeral Home in Westfield, N. J., where Mr. Kite lived. Interment was in Fredericksburg, Pa.

Great Britain

Colwyn Medal Award

At a meeting of the Council of the Institution of the Rubber Industry, held in London, the Colwyn Medal was awarded to Jean Le Bras, Inspector General, Institut Français du Caoutchoue, Paris, for conspicuous services of a scientific nature, particularly for his work on antioxidants and biosynthesis as well as on chemical derivatives of natural rubber.

On this occasion, too, the Hancock Medal was awarded H. Willshaw, O.B.E., chief consulting engineer, Dunlop Rubber Co., Ltd., and director and general manager of Dunlop Advisory Service, Ltd., for outstanding service in the field of education.

NEWS from ABROAD

Germany

1957 Industry Output Establishes New Record

The slight decline in the production of rubber goods by the German industry in 1956 was more than made up in 1957; final figures for the latter year not only were 4.9% above those for the preceding year, but also 3.6% above the high level of the record year 1955. The comparative totals were 401,331, 382,660 and 387,349 tons for 1957, 1956 and 1955, respectively.

In 1957 the share of the tire industry, including tire repair material, was 184,378 tons, or 45.9% of the total, against 216,953 tons, representing 54.1% for general rubber goods. An analysis of comparative data for the three years under review reveals that the good showing in 1957 for the whole industry was due largely to the increase in automobile tires, tire repair material, footwear, belting, soft rubber, and foamed rubber goods which offset the losses in other lines. Production of cycle tires has been going down, and 1957 figures were substantially below prewar levels even; motorcycle tires show a similar, if less marked tendency; while heavy-duty tires, (mainly truck tires, however) after reaching record quantities in 1955, fell sharply in 1956, and only improved figures for bus and land tractor tires brought the total for heavy-duty tires in 1957 slightly above that for 1956. The cycle and motorcycle tire trade is suffering from the trend away from these vehicles in favor of the small car; the government policy of favoring railroad transportation is blamed for the truck tire situation.

Increased industrial activity, in general, is responsible for the high 1957 output of conveyor belting, which even exceeded that of 1955. On the other hand, lined hose, rubber-coated fabrics, and hard rubber goods showed the effects of the invasion by plastics.

Table 1 gives production figures for the main types of rubber goods in 1955, 1956, and 1957.

Figures for raw materials used by the rubber industry indicate that German manufacturers are using more and more synthetic rubber. In 1957 it represented 21% of the total consumption of new and reclaimed rubber, showing an increase of 33.2% against 1956 use, and 87.5% against 1955 use. Larger amounts of plastics are also being used in the rubber industry; the increase, as compared with 1956, was 39.6%. At the same time consumption of new natural rubber is falling off—it was 3.6% less than in 1956 and almost 15% less than in 1955. Table 2 shows consumption of raw materials in 1955, 1956, and 1957.

Cold Rubber, Nitrile Neoprene Output Upped

Large-scale production of cold rubber has now been started at the Marl factory of the Buna Werke Huls, it is reported. Originally capacity was expected to be 45,000 tons, but it now appears that initial output will be 50,000 tons a year, which could be raised to 70,000 tons, and that, if necessary, 90,000 tons could be manufactured annually with only relatively small expansion of existing facilities. Staining and non-staining and oil-plasticized types will be made, and probably two carbon black masterbatches as well.

Various petrochemical raw materials will be supplied by Esso A. G. under agreements, some of which are understood to be effective for ten years. Esso will supply Chemische Werke Huls A. G. and Buna Werke Huls with unsaturated carbons in the form of gas for synthetic rubber and for certain plastics, via a 90-kilometer pipe line which it is proposed to run between the Esso refineries at Cologne and the factories at Huls.

It is also learned that Farbenfabriken Bayer A.G., Leverkusen, plans a substantial increase in the production of oil-resistant Perbunan rubber and will utilize for this purpose butadiene becoming available from the manufacture of cold rubber at Huls, as well as from the petrochemical installations of Erdolchemie, G.m.b.H., Dormagen. Output of Perbunan N (acrylonitrile rubber) will be raised to 12,000 to 15,000 tons annually, to meet the expected requirements of the nations belonging to the European Common Market.

A like amount of Perbunan C—that is neoprene-type rubber—will also be made, under license from Du Pont. Manufacture of various types of Perbunan C was recently started by Bayer in collaboration with Knapsack-Gries-

TABLE 1. WEST GERMAN PRODUCTION OF RUBBER GOODS (INCLUDING WEST BERLIN)

	1955	1956	1957
Cycle tires	16,241	16,701	15,678
Motorcycle and automobile tires	54,270	59,839	65,933
Tires for commercial vehicles	94,429	81,432	81,513
Tire repair material	16,355	18,507	21,254
Total tire industry	181,295	176,479	184,378
Heels and soles	43,889	43,391	43,671
Footwear	15,202	12,302	13,421
Conveyor belting	10,836	10,437	11,974
Lined hose	12,807	12,342	12,549
Other soft rubber mechanical goods	63,054	66,182	69,067
Surgical soft rubber goods, including foamed rubber and toys	15,951	16,611	19,462
Rubberized fabric and products thereof	7,467	6,717	6,678
Other soft rubber goods	26,252	27,688	30,002
Hard rubber goods	10,596	10,511	10,129
Total other goods	206,054	206,181	216,953
Grand total	387,349	382,660	401,331

TABLE 2. CONSUMPTION IN TONS OF RAW MATERIALS

	1955	1956	1957
Natural rubber	134,178	118,648	114,422
Synthetic rubber	24,216	34,098	45,413
Plastics	6,475	9,154	12,782
Reclaim and ground rubber	42,517	44,788	44,072
Total	207,386	206,688	216,689

heim A.G., with the latter supplying the chlorobutadiene monomer, while Bayer polymerized it.

Kautschuk und Gummi,[1] in discussing the new synthetic rubber developments in Germany, pointed out that in March, 1958, estimates had put total output capacity of the members of the European Common Market in 1960 at 199,000 tons of synthetic rubber annually. But in view of the planned increase in Perbunan, the revised cold rubber capacities of Bunawerke Huls, and the probability that the Common Market nations would meantime also have acquired the necessary experience for expansion, it is considered that by 1960 total capacity of synthetic rubber is more likely to be 250,000 tons a year. The Common Market nations together used about 453,000 tons of new rubber last year, of which about 23.5%, or approximately 107,000 tons, were synthetic rubber. With an annual increase of 6% in consumption of new rubber, the proportion of synthetic rubber to natural rubber consumption is expected to reach 38% by 1960 so that the synthetic rubber output could be sold within the territories of the Common Market group.

It is feared, however, that surpluses in the United States, where capacity is in excess of local requirements, will tend to depress prices of synthetic rubber produced in Western Europe, but even greater pressure is foreseen from the East European bloc which, with its growing capacity, will shortly appear as a supplier of synthetic rubber on the world market.

[1] June, 1958, p. 125.

Malaya

USSR, Red China Take More Rubber in 1958

As reported in these columns last month, rubber exports from Malaya during the first half of 1958, at 523,255 tons, were up 11½% over those for the same period last year. From additional figures later available, it appears that Red China has become a factor to be reckoned with on the Malayan market. Complaints about the quality of Malayan rubber notwithstanding, China bought 7,146 tons of rubber in June, bringing the total for the first six months of the year to 40,200 tons, against only 845 tons in the 1957 period. After Britain, the United States, and Japan, in that order, China is now Malaya's fourth best customer for rubber. Russia has meantime been increasing direct purchases from Malaya; in the first half of 1958, she took 10,974 tons, an increase of 47.6% over last year's sales.

Latex exports fell off markedly in June; nevertheless the six-months' total at 56,699 tons was up 15½% as compared with the 1957 figure.

In the half year under review, Sumatra shipped 94,684 tons of rubber to Singapore and 16,999 tons to the Federation, representing increases of 20% and almost 66%, respectively, over last year's figures. At the same time Singapore received 53,075 tons from Indonesian Borneo, up 27% for the period.

Rubber production for all Malaya came to 302,371 tons in the period under consideration, or 1% under the 1957 amount. The difference was entirely due to a 6% drop in output by smallholders, which could not be quite offset by the 3% increase from the estates. The respective amounts were 124,277 and 178,094 tons.

Red China Undersells Britain on New Tires

Red China is preparing to sell passenger-car tires in Malaya at prices 17-18% below those for British tires, which now form about 50% of Malayan tires imports, it is learned. China's entry into the local tire market started inconspicuously enough last year when she sent bus and truck tires valued only at $1,196 (Straits currency); but passenger-car tires have now also been added, and total arrivals are expected to reach a value of $4,000,000 (Straits currency) this year.

The tires are made by two firms, Ta Chung Ha and New China, and are being handled in Malaya by Lam Sing Hang Co., Ltd., which has been appointed sole agent in Malaya for the government foreign trade organization, China National Import & Export Corp., of Shanghai.

According to the local agent, about 1,000 tires of various sizes had already arrived by mid-July; they are understood to be made entirely of natural rubber and are claimed to be comparable with British products. Sales on the local market have reportedly been highly promising.

China-made tires now available here include those for jeeps, light trucks, and five-ton heavy-duty trucks, as well as passenger cars. Eventually other rubber products will also be exported to Malaya from China, including transmission belts and hose.

In 1957, Malaya imported automobile tires to a value of $6,556,546 (Straits), almost half of which was supplied by Britain; West Germany accounted for $1,000,000. In addition Britain sent bus and truck tires valued at almost $10,000,000 (Straits); while Japan, second largest supplier of these goods, sold $3,000,000 worth.

Price Fluctuation Memorandum by Adams

The public has finally been allowed to learn the details of the memorandum on rubber price fluctuations, prepared by P. E. Adams, of the Ministry of Commerce, here, and presented, in all secrecy, at the last Rubber Study Group Meeting in Hamburg. The memorandum discusses six ways to help remove the causes of rubber price fluctuation and reduce its impact: (1) improving statistics to make them more up-to-date, accurate, and comprehensive; (2) avoidance of abrupt changes by governments in export duties on rubber and in foreign exchange policies; (3) maintenance of larger stocks by consumers; (4) more steady buying by consumers on the basis of consumption requirements; (5) greater facilities for and greater use of hedging; (6) prevention of excessive dealing, especially by the inexperienced.

Mr. Adams is clearly against price stabilization; he points out that the cost of stabilizing the price at the synthetic rubber level would probably more than outweigh any advantage; while stabilizing it above competitive level with synthetic rubber, would only lead to further expansion of synthetic production and further loss of markets for natural rubber.

He called attention to the way the market was influenced by inflexible buying policies of the four big American rubber manufacturers, and also of the chief British rubber manufacturer.

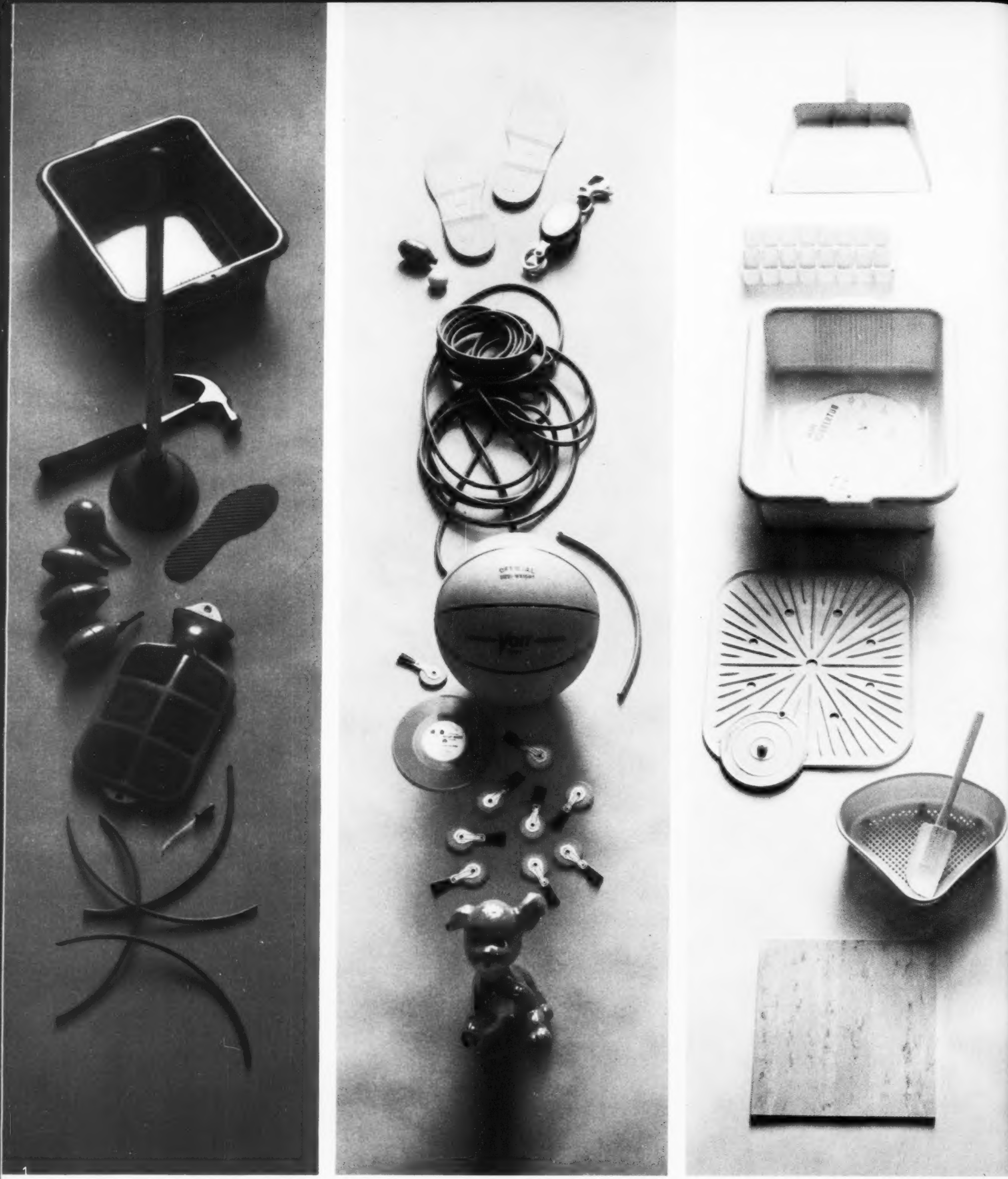
Wage Dispute Actions

Wage discussions, which had reached a deadlock at the end of June, were reopened three weeks later, thanks to the intervention of the government. By the beginning of the second week of August no progress had been made; on the contrary, feelings on both sides seem to have become further exasperated.

Unrevealed proposals by the MPIEA (owners) were met by unrevealed counter-proposals from the Union. Finally, the latter seems to have become impatient at the delay in reaching a settlement and warned owners that there would be serious repercussions in the industry if no agreement on wage demands was reached by September 15.

The MPIEA replied that it would not be stampeded into a settlement by threats, that it was working on certain proposals which would shortly be put before the Union, but made it perfectly clear that its stand continued to be that of adhering to the principle that wage rates in the rubber industry must be dictated by price, since the capacity to pay varies almost directly with

(*Continued on Page 945*)



Contact Columbia-Southern for specific information on brand names and availability of any of these quality rubber goods.

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F R A N C I S

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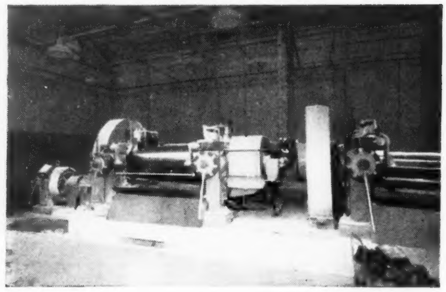

quality engineering puts efficiency into Shaw machines

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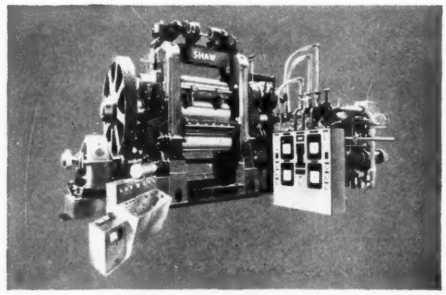
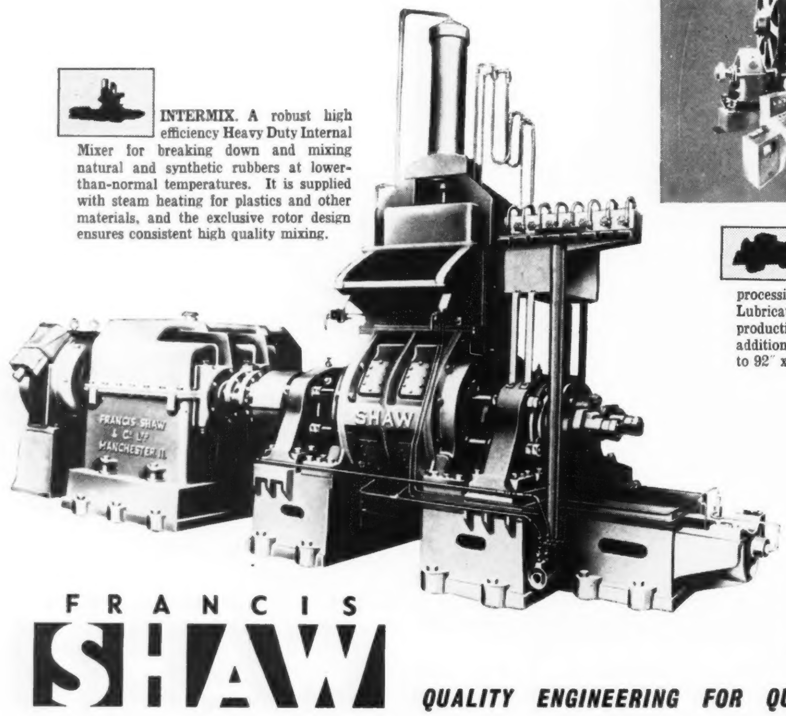
TWO-ROLL MIXING MILL For the efficient mixing and warming of all thermoplastic-thermosetting materials Shaw produce a range of mills from 13″ x 16″ up to 84″ x 26″. Supplied in batteries or with individual drives, these machines are capable of high sustained output. Single or double geared models available. The machine shown is fitted with Lunn Safety Gear.

Francis Shaw are available for the design, manufacture and installation of a wide range of processing equipment



CALENDER. A comprehensive range of Francis Shaw Calenders is available for the processing of all rubber and plastic materials. Flood Lubrication and hydraulic roll balancing available on all production sizes. Roll Bending can be fitted as an additional refinement. All sizes available from 13″ x 6″ to 92″ x 32″. Two-, Three, and Four-Bowl Designs.



INTERMIX. A robust high efficiency Heavy Duty Internal Mixer for breaking down and mixing natural and synthetic rubbers at lower-than-normal temperatures. It is supplied with steam heating for plastics and other materials, and the exclusive rotor design ensures consistent high quality mixing.

Adamson United Co., 730 Carroll Street, Akron, have the manufacturing and selling rights of the Shaw Intermix and hold non-exclusive selling rights in Central America, South America, and Mexico.

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P1156

NEW MATERIALS

Neoprene Latex 673

Neoprene Latex Type 673, a high solids latex designed for adhesive applications, has been announced by the elastomer chemicals department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. The new latex, an aqueous colloidal dispersion of a neoprene which is very light in color and exhibits an exceptionally fast rate of crystallation, is anionic, coagulates rapidly under pressure, and yet has good colloidal stability in typical adhesive formulations.

Because of its pressure sensitivity, coated surfaces combined, while wet, are said to develop adhesive and cohesive strength rapidly. It is especially useful in adhesive compositions of the contact-bond type. Adhesives formulated using Neoprene Latex Type 673 are claimed to have high bond strength at elevated temperatures. In this property Type 673 adhesives compare favorably with commercial solvent-type adhesives and are superior to Neoprene Type 572 adhesives, according to the manufacturer.

Some typical physical properties of Type 673 follow:

Solids content, %	58
Specific gravity at 25° C.:	
Wet latex	1.12
Dry polymer	1.23
Initial pH	12.2
Color of polymer	water white
Odor	none after drying
Mechanical stability	good
Stability toward storage	fair
Compounding	excellent

The addition of tackifying resins to Type 673 latex reduces room temperature cohesive strength only slightly, compared to similar compounds based on Type 572 latex. Besides its excellent cohesive strength, the polymer from Type 673 latex exhibits the good aging, heat, solvent, and flame resistance typical of neoprene.

A technical bulletin, Report No. 58-5 which gives various formulations and properties of adhesive assemblies, and data on tackifiers and thickeners in Neoprene Latex Type 673, is available from the company.

Pliolite S-6E

Pliolite S-6E, a new electrical-grade rubber reinforcing resin designed to meet requirements of the electrical wire and cable industry, has been developed by the chemical division of The Goodyear Tire & Rubber Co., Akron, O. Excellent electrical properties of the new styrene-butadiene copolymer are made possible through improved polymerization techniques which greatly reduce ash content and water absorption.

Pliolite S-6E in rubber stocks is said to increase hardness, stiffness, flex life, and abrasion resistance. The resin also furnishes excellent tear resistance and greatly improves aging characteristics. It exhibits exceptional processability and makes possible production economies since it disperses readily on a mill or in a Banbury mixer.

Its plasticization and nerve reduction characteristics improve extrusion operations by curtailing shrinkage, affording smoother surface, and by controlling shape and thickness. These processing characteristics facilitate production of exactly centered, thin-walled insulated wire and cable of uniform thickness. The new reinforcing resin is also suggested for use in light or dark rubber stocks requiring high electrical resistance and/or low water absorption properties.

Some typical raw resin properties of Pliolite S-6E follow:

Polymer composition, %	85 styrene/15 butadiene
Specific gravity	1.04
Ash, % (total)	0.08
Softening point, °C	48
Bulk density, lb./ft.^{3}	19.2
Solubility	very limited in aromatic hydrocarbons, chlorinated hydrocarbons, ketones
Heat stability	no change in properties after several hours @ 250° F.
Typical particle	porous granules
Color	white
Taste	none
Toxicity	non-toxic

A technical bulletin, No. 58-188, giving more detailed properties and a formulation of Pliolite S-6E, is available from the company.

Harflex 375 Polymeric Plasticizer

Harflex 375, a high polymeric plasticizer of maximum permanence and stability, may be used in the following applications: vinyl films, especially those for adhesive applications; electrical cable jackets; gaskets; oil-resistant vinyl and synthetic rubber hose. Other applications are in vinyl tubing, upholstery, food belting, rigid and semi-rigid vinyl resins, and coatings for fabrics, leather and paper.

Manufactured by Harchem Division, Wallace & Tiernan, Inc., Belleville, N. J., Harchem 375 is said to be almost completely resistant to extraction by soapy water or solvents. It is also claimed to possess the best low-temperature flexibility obtainable in a true polymeric plasticizer and excellent aging both at high temperatures and in sunlight.

Some typical physical properties of Harchem 375 follow:

Appearance	clear liquid
Color	amber
Odor	very mild
Boiling point	not distillable
Fire point	625° F.
Flash point	585° F.
Freezing point	15° C.
Specific gravity, 25/25° C.	1.061
Refractive index, 25° C.	1.4676
Viscosity, @ 100° F.	45,000 cs.
210° F.	4,000 cs.
Wt./gal., 25° C.	8.81 lbs.

Harchem 375 is claimed to be compatible with vinyl chloride polymers and copolymers, nitrocellulose, and synthetic rubbers; partly compatible with polyvinyl acetate and polymethyl methacrylate; and incompatible with polystyrene, cellulose acetate, ethylcellulose, and cellulose acetobutyrate.

A data sheet on Harchem 375 with specifications and test results on its use in a PVC resin is available from the company.

Cyan Blue XR-55-3770

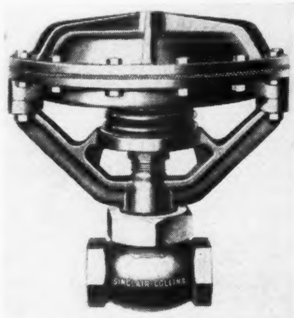
A very red-shade crystal stable phthalocyanine blue, designated as Cyan Blue XR-55-3770, is available to the color-consuming industries for the first time. A development of the pigments division of American Cyanamid Co., New York, N. Y., this new colorant is an all-purpose, full-strength copper phthalocyanine pigment. Its crystal stability is demonstrated both at elevated temperatures and in aromatic solvent systems.

Based on past experience, pigment users expect to find the red shades of copper phthalocyanine blue less crystal stable than the greener types, drifting greener and duller and weaker in the presence of aromatic solvents or in plastic compounds processed at high temperatures. This reaction is typical of the conventional copper phthalocyanine pigment and is attributed to a change of

(Continued on page 933)

NEW EQUIPMENT

S-C Diaphragm Valves



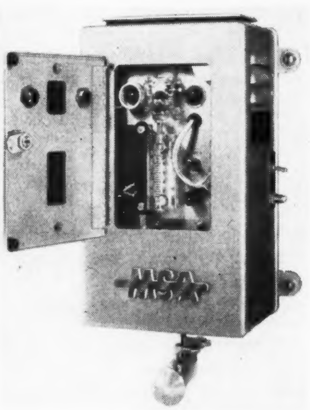
S-C diaphragm-operated globe valve

A complete line of diaphragm-operated direct-acting globe valves, for hot or cold service with steam, raw water, gas and air, has been announced by The Sinclair-Collins Valve Co., Akron, O. Available in two series, for 150 and 300 psi. service in sizes ranging from ¼- to three-inch NPT, S-C direct-acting globe valves are said to provide fast response, leakfree performance, and long service life with minimum maintenance.

Valve bodies are of Navy M bronze, and all cast trim is special alloy bronze. For wear and corrosion resistance, top-guided stem and disk are K-monel. Replaceable seat ring is hardened and ground stainless steel. Seats are lapped at assembly, and all parts are interchangeable to simplify in-use maintenance, the manufacturer states. Teflon-asbestos packers are said to prevent leaks at the stem. Diaphragm tops are designed for air operation at 30-35 psi.

The company also manufactures a complete line of ½- to three-inch NPT medium and high-pressure diaphragm-operated control valves for oil, air, steam, and hot or cold raw water service, as well as various types of automatic valves for special aplications.

M-S-A Explosilarm



M-S-A Explosilarm

The M-S-A Explosilarm, a small completely self-contained combustible gas alarm, has been announced by the Mine Safety Appliances Co., Pittsburgh, Pa. The new combustible gas alarm features minimum first cost, negligible installation cost, and low maintenance. It is intended for installation in non-hazardous areas, and a sample line as long as 100 feet may be used.

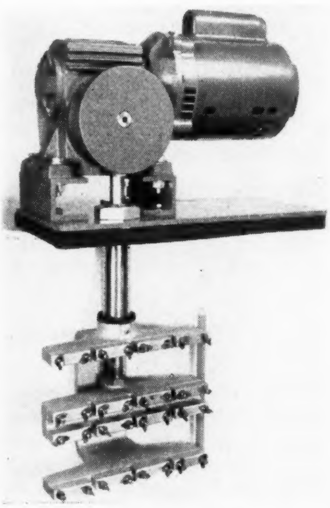
The new Explosilarm can be used advantageously in industrial plants wherever any combustible gas is used, by oil and gas industries in petroleum refineries and around scattered natural gas operations and gas compressor stations, in pump rooms for flammable products, on gas-fired industrial ovens to check the atmosphere before igniting burners, for checking leaks of hydrogen or natural gas in cable vaults, laboratories, etc., and wherever there is a combustible gas problem that does not justify a large installation.

The principle of operation is the same as in other larger

M-S-A gas alarms and analyzers. The platinum filaments in the balanced-bridge circuit, which catalytically ignite any gases present and then actuate an alarm, are designed for long life, for interchangeability without matching pairs, and have extreme zero and calibration stability. A locking door panel prevents tampering with controls.

The M-S-A Explosilarm is contained in a cabinet 8¾ inches wide, 14¼ inches high, and 6¼ inches deep.

New Dynamat Tester



Dynamat rubber stretching apparatus

The MDC Model 701-1 Dynamat, a rubber stretching apparatus, will stretch rubber samples of the type used in rubber research tests. It can be used to determine the degree of rubber deterioration caused by ozone on constantly flexing rubber. Up to 12 rubber samples can be individually mounted in a flat unstretched state, stretched 25%, and returned to the original unstretched state at a rate of 30 cycles per minute.

The distance between clamps at the minimum stretch position is two inches. Zeroing marks indicate maximum-minimum clamp separation to assure proper sample mounting. Mounted samples are held firmly in wing nut tensioned aluminum clamps. The power requirement is 110-115 volts, 60 cycle, a.c., 150 watts.

The Dynamat is built in accordance with the recommendations of the ASTM Committee D-11 on Rubber & Rubber-Like Materials, according to the manufacturer, the Mast Development Co., Inc., Davenport, Iowa. This device, moreover, will accommodate the standard rubber sample recommended by ASTM.

Although primarily designed for installation in the MDC Model 700-1 ozone test chamber, the Dynamat can be mounted anywhere that stretching of rubber samples is needed, including outdoor mounting for exposure tests. Additional information may be obtained by writing the manufacturer.

Cyan Blue XR-55-3770

(*Continued from page 929*)

crystal habit. Now compounders and formulators of plastics, rubber, and inks, plagued with problems of color drift, can find an answer in this new pigment.

Cyan Blue XR-55-3770 has the following typical properties:

Specific gravity	1.52
Wt./gal., lb	12.7
Bulking value, gal. lb	0.0787
Oil absorption	19.2
Specific resistance, ohm-cm	15,000

Its resistance to bleed in solvents is excellent, according to the company. Cyan Blue XR-55-3770 also has excellent acid and alkali stability, light fastness, and durability.

NEW PRODUCTS

BJ Rubber Floor Mat

Byron Jackson Tools, Inc., industrial rubber products division, Los Angeles, Calif., has made available its new rubber floor mat for industrial use. Made of heavy-duty, oil-resistant rubber, the 32- by 32-inch mat protects the feet from dampness, cold, slipping, and electrical shock. Its thousands of built-in shock absorbers minimize fatigue of workers who stand in one position for long periods of time.

The non-skid mat is divided into 16 eight-inch squares which can be easily cut apart to surface stairs and other small areas. Several mats may be laid together to cover larger working areas of any size.

The floor mat is manufactured and sold by the PB industrial rubber products section of the company, which is a subsidiary of Borg-Warner Corp.

Koroseal Conveyor Belting

B. F. Goodrich Industrial Product Co., Akron, O., has announced the first heavy industrial conveyor belt made with smooth, non-porous covers of Koroseal polyvinyl chloride. According to the company, Koroseal covers resist oils, grease, and most acids and protect against abrasion, cutting, and gouging. Covers are said to be the same tough, flexible material used in manufacturing Koroseal flooring and bus upholstery.

The new belt is designed especially for use in metal-working plants, chemical plants, assembly plants, pulp mills or the glass, plastic, or textile industries—wherever resistance to cutting oils and greases and a smooth, non-marking cover are required. The belt is available in widths up to 48 inches, reinforced with from two to four plies of 42-ounce fabric.

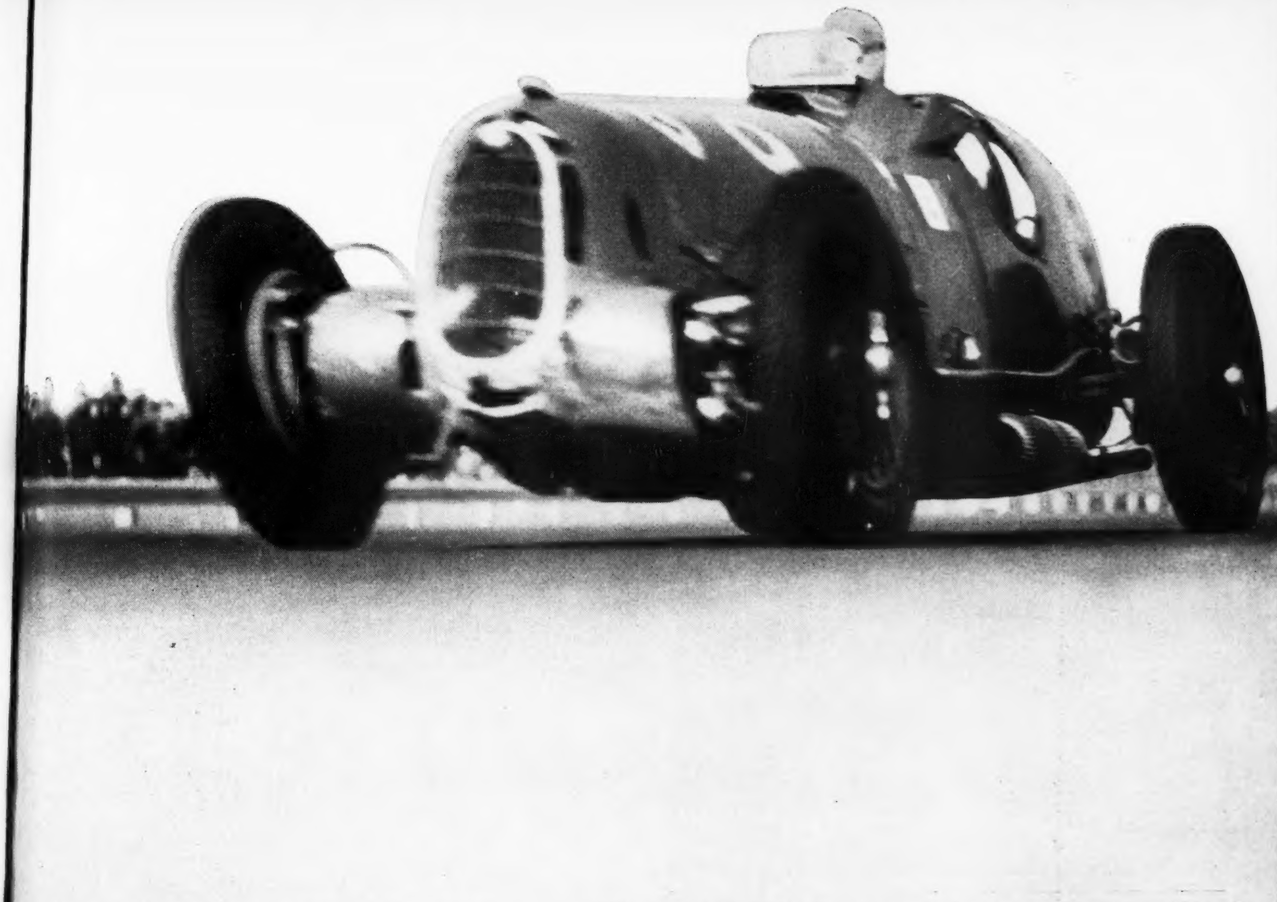
Gold Seal Tire

Dunlop "Gold Seal"

A premium-quality nylon passenger tire has been introduced by Dunlop Tire & Rubber Corp., Buffalo, N. Y. Named "Gold Seal," the new tire has been designed especially for nylon and is available in 14-inch and 15-inch sizes with either black or white sidewalls. The "Gold Seal" carries a 2½-year road hazard guarantee.

"Cobra Curve" tread design—a combination of traction elements which adjust automatically to changing driving and road conditions—is the latest chapter in the company's history of pioneering advances. While the tire excels at the routine functions of starting, stopping, etc., it incorporates the added advantages of increasing directional stability and eliminating side-slip.

The wide, husky shoulder ribs and unique circumferential siping elements of the "Gold Seal" are said to prevent uneven tread wear. The tread contour remains constant, even after thousands of miles, it is further claimed. Corner squeal caused by tread vibration is said to be eliminated by the wide, outside ribs and their revolutionary continuous sipe. Directional stability is assured by the solid, unsiped, serrated center rib.



New Products

Fisk Flotofoam Mattress

United States Rubber Co., New York, N. Y., has introduced a new line of foam mattresses, called Fisk Flotofoam, made of an entirely new construction, that will be sold as blanks directly to mattress manufacturers. The new mattresses are 4½-inch full depth foam. They will also be manufactured in long twin and long full sizes.

The Fisk Flotofoam mattresses, reports the company, are made on distinctive molds, with one-inch cores in the center and 1¼-inch cores at each end. This construction is said to enable the firm to produce quality, durable foam mattresses at a reasonable price, mattresses that will give greater support in the center, yet a luxurious feeling for sleeping.

The mattresses are being produced in two densities, standard and firm, with no mattress under 19 pounds density.

Fisk Flotofoam mattresses will be made in the company's Woonsocket, R. I., and Santa Ana, Calif., plants. Stocks will be maintained in the Mishawaka, Ind., plant.

Steel Meshield Gloves

Newest addition to the industrial glove line of The Surety Rubber Co., Carrollton, O., is the Meshield. Produced with a soft comfortable cotton flannel base, the four-ply stainless-steel mesh is firmly sewn to the glove, providing easy flexing with maximum protection against short or abrasive objects.

Meshield may be worn as produced or can be used as a liner glove under any other type of work glove—old or new. Particularly important to workers in handling sheet steel, castings, and where knives or machettes are used, these gloves are available in gauntlet style with full coverage or breathing backs with palm and finger coverage only.

New Vinyl Flooring

A new, quality-line of vinyl tile, revealing a unique surface design effect and called Cloisonne, was unveiled at the summer flooring market in Chicago, Ill., by The Goodyear Tire & Rubber Co., Akron, O. A three-dimensional surface effect has been achieved by utilization of an exclusive company manufacturing process. The line is one of several new vinyl developments introduced by the firm at its market display.

The surface phenomenon seen in Cloisonne involves an intricate combination of hundreds of vinyl chips made from several basic colors, it was reported. The new production technique gives an unusually durable, all-vinyl, homogeneous tile, with each color chip set off individually in such a manner that a three-dimensional surface effect is produced. Styled to meet the tastes of both the decorator and the homeowner, 11 colors, mostly pastels, are being offered to the market in residential gage only.

Also making debuts were two additions to Goodyear's NoScrub line,[1] the low-cost, all-vinyl tile introduced at the January market. New materials include a Romance pattern and two cork styles.

The Romance pattern simulates the old world marbleized design, embodying metallic colors to give brilliance and luster. Four styles are being offered, varying from a parchment effect through metallic gold. To meet the heavy demand in cork styles, a light and a dark tone are now in production. Both the cork and Romance styles are constructed with matching color backs.

Another major development having its initial market showing is the firm's new economy, all-vinyl counter topping material. Featuring two designs — linen and frost — the new materials are being produced in 36- and 45-inch roll widths with a choice of four colors — grey, green, yellow, and tan — in each finish.

[1] See RUBBER WORLD, Mar., 1958, p. 926.

TECHNICAL BOOKS

BOOK REVIEWS

"British Compounding Ingredients for Rubber." By B. J. Wilson. Cloth covers, 6 3/16 by 9 5/16 inches. 548 pages. Published by W. Heffer & Sons, Ltd., Cambridge, England, for the Research Association of British Rubber Manufacturers (RABRM). Price £3 ($8.46).

This book is a comprehensive list of proprietary British and Commonwealth compounding ingredients for rubber. It contains details of the chemical compositions, physical properties, uses, and suppliers of all types of compounding ingredients for rubber which are manufactured in the United Kingdom, or in British Commonwealth countries, and which are marketed under distinctive trade or grade names.

The book is divided into main parts as follows: Compounding Ingredients for Natural and Synthetic Rubbers; Compounding Ingredients and Processing and Modifying Agents Specifically for Natural and Synthetic Rubber Latices; Special-Purpose Products; and Indices. The first three main parts are subdivided into a number of sections, each of which deals with a particular class of compounding ingredient or allied chemical product. The method of subdivision and the choice of section headings are based on the compounding ingredients sections of the RABRM, or International Committee for the Classification of Rubber Information (ICCRI) classification systems for rubber information, and each entry bears as its last line a number denoting the class in which the material will be found in this code.

Special-purpose products include materials which cannot properly be classified as rubber compounding ingredients but are nevertheless of importance to the industry. This part of the text, therefore, includes the following sections: Dusting and Antitack Agents, Mold Lubricants, Reclaimed Rubbers, Reclaiming Agents, Solvents, Specific Ingredients for Rubber Solutions, and Synthetic Rubbers and Latices.

There are two indices. The first lists in alphabetical order the names, addresses and telephone numbers of United Kingdom manufacturers and suppliers mentioned in the text, and the second is an alphabetical listing of all trade and grade names mentioned as well as all chemical and mineralogical names.

About 1,600 ingredients, representing the products of some 300 companies, are described in considerable detail.

"A Concise Guide to Plastics." By H. R. Simonds. Cloth covers, 6¼ by 9¼ inches, 328 pages. Reinhold Publishing Corp., New York N. Y. Price $6.95.

This is a brief handbook covering the plastics industry from basic materials through applications and processes to the prediction of the industry's future economic status. With such a broad coverage of subjects and limited space, the author was not able to delve into the highly technical aspects of the many individual plastic materials discussed.

Chapter headings are: Introduction; Properties of the Commercial Plastics; Forms of Plastics; Production and Prices; Applications; Processes; Selecting the Plastic; Material Manufacturers' Statements; The Future of Plastics; Trade Names; and Subject Index.

Although low-pressure polyethylene and the Ziegler catalysts are discussed, the up and coming first cousin of polyethylene—Hercules Powder and Montecatini's polypropylene—is not mentioned. Both polymers are produced by the Ziegler process.

Chapter 8, Material Manufacturers' Statements, is a sort of abbreviated Standard & Poor's type of statistical tabulation for

the 42 most important plastics materials manufacturers. The business-minded chemist will have a "heyday" here!

Chapter 9, The Future of Plastics, is an ambitious attempt to predict the economic future of several "plastic-families" such as the vinyls, polyesters, melamine resins, and so on.

The book closes with Chapter 10—37 pages of trade names.

This book is a guide to the plastics industry for persons with little knowledge of the subject and with little or no chemical background.

NEW PUBLICATIONS

"Synthetic Rubber Facts." The Firestone Tire & Rubber Co., Synthetic Rubber & Latex Division, Akron, O. This handbook, covering a wide variety of topics on synthetic rubber, will be a valuable reference to chemists, engineers, purchasing agents, and managers connected with the rubber trade. The topics include history, economics, chemistry; specifications—rubber and latex; test methods; handling of rubber and latex; applications of latex; applications of rubber; and tables. Most of these sections contain specially prepared articles, described below.

Such articles are "History of Synthetic Rubber," by E. L. Carr and R. L. Bebb; "The Economics of Synthetic Rubber," E. D. Kelly; "The Chemistry of Synthetic Rubber," E. L. Carr, R. L. Bebb, L. B. Wakefield, G. Crane; "Handling and Storage of FR-S Latices," D. W. Cate; "Latex Compounding," W. W. Bowler and E. M. Glymph; "Latex Foam," L. A. Wohler; "Principles of Rubber Compounding and Vulcanization," G. Alliger and J. M. Willis; "Protection of Rubber Products against Deterioration," W. S. Cook, R. F. Dunbrook, G. E. P. Smith, Jr.; "The Use of FR-S in Passenger Body Stocks," R. G. Arthurs; "FR-S in Black Passenger Sidewalls," A. W. Warren; "FR-S and Natural Rubber Blends in White Sidewall Compounds," W. C. Rowe; "FR-S in Passenger Tread Stocks," E. R. Sourwine; "FR-S in Tread Rubber (Camelback)," S. J. Fabian and E. J. Valenter; "FR-S in Bead Wire Insulation," C. A. McCall; "FR-S in Truck Tires," B. Kastein; and "FR-S Rubber in Mechanical Rubber Goods," J. J. Allen *et al.*

The specifications for FR-S rubbers and latices are based upon those established by the Office of Synthetic Rubber, FFC, and upon statistical treatment of data taken during the production of the compounds. The test procedures described are a compilation of test methods useful to assess the quality of SBR rubbers and latices. These methods are compiled from ASTM publications, "Specifications for Government Synthetic Rubbers," and the company's laboratories. In most cases the methods are also applicable to other synthetic rubber and latex types.

"Dynamic Properties of Enjay Butyl and Their Applications." Enjay Co., Inc., New York, N. Y. 16 pages. This is the sixth of recent bulletins on butyl rubber and includes diagrams which help explain in detail the dynamic properties and applications of the firm's butyl rubber. Vulcanization data, butyl adhesion to metal, property information, tire implications are covered.

"Choosing the Right Polyglycol." The Dow Chemical Co., Midland, Mich. 24 pages. The booklet, a revised edition, identifies the firm's polyglycols as members of its family of polyols. Polyglycols are high molecular weight compounds produced by reacting alkylene oxides with compounds having an active hydrogen. Among those described are polyethylene glycols, polypropylene glycols, polybutylene glycols, polyepichlorohydrins, polystyrene glycols, and miscellaneous polyglycols. The polyols are used as intermediates or formulating ingredients in the making of cosmetics and pharmaceuticals, in urethane compounds, rubber lubricants, industrial metal-working fluids, high-temperature lubricants, plasticizers, ink and dye solvents, anti-foam agents, surface-active agents, brake fluids, mold release agents, petroleum demulsifiers, wax polish emulsifiers, agricultural spray spreaders, leather dye suspending agents, textile lubricants, sizes and softeners, and many other uses.

Rubber parts courtesy of Brown Rubber Co., Inc.

Technical Books

Publications of Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.:

"Marvinol VR-51." 8 pages. Newest in the firm's line of Marvinol vinyl resins is Marvinol VR-51, a plastisol resin designed specifically for slush and rotational molding. This material is said to have outstanding viscosity and air release properties and to provide uniformity, excellent heat stability, and improved product quality. This technical bulletin contains numerous graphs which compare its properties with other resins as well as formulations and a list of the other Marvinol resins.

"Plasticizers for Paracril Ozo." Bulletin No. 226. W. E. Galwardy. 8 pages. This report contains an evaluation of various plasticizers in several Paracril Ozo compounds and the discussion of their results. Plasticizers evaluated include DOP, Heroflex 150, DOA, DIDA, KP-140, Bearflex 1751, Synthetics L-1, and Chlorowax. Processing data, physical properties, low-temperature flexibility, flame retarders, heat aging, and sunlamp discolorations are other topics in this report.

Publications of the Harwick Standard Chemical Co., Akron, O.:

"Stan-Tone Paste Colors." #02-177-7-6-58. 2 pages. The paste colors described in this data sheet are selected organic and inorganic pigments flushed or dispersed in a plasticizer to produce a uniform, smooth paste. These colors are recommended to vinyl formulators for use in plastisols, organisols, dry blending, and as direct mill and Banbury additives. Data given include Stan-Tone color number, pigment type, % pigment, % DOP, % Paraplex G-50, light and heat, and bleed and migration information.

"Thixon Primer P-2." #03-56-8-6-58. 2 pages. This recently revised data sheet covers the function, composition, properties, consistency, and application data on Thixon Primer P-2, a rubber-to-metal bonding primer manufactured by Dayton Chemical Products Laboratories, Inc. It is suggested for use with natural rubber, SBR, neoprene and butyl stocks, as a prime coat, for sand- or grit-blasted steel, aluminum, stainless steel, leaded brass, non-leaded brass, copper, lead, etc., when used in conjunction with other special cements.

Publications of The Goodyear Tire & Rubber Co.'s chemical division, Akron, O. (Tech-Book Facts):

"Pliovic AO Fusion Characteristics." No. 58-94. 2 pages. This bulletin gives temperature-viscosity relation data, fusion temperature, and test formulation information on Pliovic AO plastisol. Graphs and tables are provided.

"Compounding Study: Blends of Pliovic AO and Pliovic S50 in Plastisols." No. 58-97. 1 page. Resins of Pliovic AO and Pliovic S50 in various proportions can be used in formulating plastisols exhibiting low viscosity or high physcial properties upon fusing. Low-viscosity plastisols are discussed and formulations and physical data on resin blends are presented in tabular form.

Publications of E. I. du Pont de Nemours & Co., Inc., elastomer chemicals department, Wilmington, Del.

"Neoprene Type WB." No. 58-8. By R. M. Murray and H. D. Bond. 12 pages. Neoprene Type WB is a new polymer having outstandingly good processing characteristics. Its compounds are practically nerve-free, very smooth in appearance, fast extruding and cool running. They friction and calender well and when extruded have excellent resistance to collapse, shrinkage and die swell. Type WB vulcanizates are equal to or better than those of other W types in resistance to heat, ozone, oil and compression set, but are lower in tensile strength, elongation and tear resistance.

"New Curing System for Hypalon 20." No. 58-4. By J. B. Knox and J. Becker. 36 pages. Recently, new curing systems for Hypalon have been developed that are said to be superior to the high metal oxide systems in many applications. These improved systems allow shorter mixing cycles with less heat build-up and much greater scorch resistance. This bulletin discusses the new curing techniques involving organic accelerators with and without metallic oxides. They are compared with high metal oxide systems previously suggested.

MARKET REVIEWS

Natural Rubber

During the July 16-August 15 period the natural rubber market activity in the United States continued to indicate an early improvement in the general situation. Judging by share quotations, it is evident that the stock exchange is also taking a more optimistic view. The market is still sensitive to political developments, but with the flurry caused by the Near East crises over and with the effect of some panic buying by a few consumers and speculators wearing off, an analysis of future prospects can again be based on factors directly related to the natural rubber market. From the recent trend of the trading we consider the market basically sound and are expecting a gradual improvement in the price level.

July sales, on the New York Commodity Exchange, totaled 9,110 tons, compared with 6,120 tons for June contract. There were 22 trading days in July and 23 during the July 16-August 15 period.

On the physical market, RSS #1, according to the Rubber Trade Association of New York, averaged 23.28¢ per pound for the July 16-August 15 period. Average July sellers' prices for representative grades were: RRS #3, 24.54¢; #3 Amber Blankets, 21.84¢; and Flat Bark, 19.3¢.

Latex

During the period under review the latex market was generally very quiet, and although there have been a few scattered orders from overseas, buyers generally are still reluctant to show their hand and seem to prefer to wait a little longer before covering their future requirements. Sellers, on the other hand, appear unwilling to depress the market with cheap offers in the expectation that the differential may improve slightly when the autumn buying program does eventually begin.

Prices for ASTM Centrifuged Concentrated natural latex, in tank-car quantities, f.o.b., rail tank car ran about 36.39¢ per pound solids. Synthetic latices prices were 21.5 to 28.2¢ for SBR; 37 to 53¢ for neoprene; and 46 to 60¢ per pound for the nitrile types.

Final May and preliminary June domestic statistics for all latices were reported by the United States Department of Commerce as follows:

(All Figures in Long Tons, Dry Weight)

Type of Latex	Production	Imports	Consumption	Month-End Stocks
Natural				
May	0	....	5,004	17,604
June	0	....	5,304	17,078
SBR				
May	3,635	—	4,102	7,240
June	4,539	—	4,165	7,337
Neoprene				
May	808	0	785	1,292
June	696	0	639	1,267
Nitrile				
May	882	0	795	1,732
June	890	0	919	1,888

Synthetic Rubber

The "Third Report of the Attorney General on Competition in the Synthetic Rubber Industry," which was released in August, declared that the two developments in 1957 most significant to competition were the transition to a buyers' market and the entry of new producers into various segments of the industry. The Report seems unduly concerned about the lack of price competition and the possible inability of small business consumers to obtain enough SBR in periods of short supply.

Consumption of all types of synthetic rubber in July amounted to 63,765 long, as compared with June consumption of 69,806 tons, according to the regular monthly report of The Rubber Manufacturers Association, Inc., the drop due at least in part to plant shutdowns for vacation during the month. Production of synthetic rubber during July increased to 77,085 tons from 74,050 tons in June.

Consumption of synthetic in July, compared with June, in tons was as follows: SBR, 53,929, against 58,507; neoprene, 4,304, against 4,844; butyl 3,782, against 4402; nitrile, 1,750 against 2,053.

Exports of synthetic rubber were also lower, at 14,875 tons in July, compared to the 15,460 tons shipped out of the country in June. SBR exports dropped 1,100 tons; while neoprene, butyl, and nitrile rubber exports all rose; the net drop in exports was therefore less than otherwise would have been the case.

Apparently synthetic rubber producers anticipated increased demand in the remaining months of 1958. As noted aboye, they increased production in July in face of the lower consumption.

Scrap Rubber

Activity in the scrap rubber market during the period under review showed little change of pace. Shipments of mixed auto tires continued to be made to reclaimers at both Naugatuck and Buffalo, and there has been somewhat of an improvement in the market following the reopening of the Naugatuck mill after the vacation period. Business however, is said to be on the moderate side and certainly not what scrap rubber dealers would like to see. But there were some hopes that demand will pick up in the early fall months.

The price picture, both in the East and at Akron, remains practically unchanged, with mixed auto tires quoted at $11 and mixed auto tubes at 2.50¢ a pound.

REX CONTRACT

1958	July 18	July 25	Aug. 1	Aug. 8	Aug. 15
July	28.60	27.60	....	....	....
Sept.	28.70	27.70	28.04	28.25	28.45
Nov.	28.70	27.65	28.00	28.20	28.25
1959					
Jan.	28.55	27.46	27.90	28.11	28.15
Mar.	28.50	27.40	27.90	28.05	28.15
May	28.45	27.40	27.85	27.95	27.95
July	28.40	27.25	27.75	27.90	27.85
Sept.	....	....	27.70	27.90	27.85
Total weekly sales, tons	4,130	2,290	1,900	2,170	1,190

NEW YORK OUTSIDE MARKET

	July 18	July 25	Aug. 1	Aug. 8	Aug. 15
RSS #1	28.75	27.88	28.25	28.25	28.63
2	28.25	27.25	27.50	27.75	28.13
3	26.75	26.00	26.25	26.50	26.63
Pale Crepe					
#1 Thick	30.20	29.88	30.50	30.75	30.88
Thin	30.25	29.63	30.25	30.50	30.88
#3 Amber Blankets	22.50	22.13	22.38	22.38	22.25
Thin Brown Crepe	22.00	21.63	21.88	22.00	22.00
Standard Bark Flat	19.25	19.25	19.38	19.25	19.13

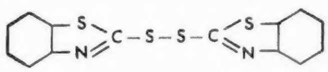
CYANAMID RUBBER Chem Lines

NO. 18 OF A SERIES Published by AMERICAN CYANAMID COMPANY, Rubber Chemicals Department, Bound Brook, New Jersey

MBTS—An Economical Accelerator For a Wide Range of Stocks

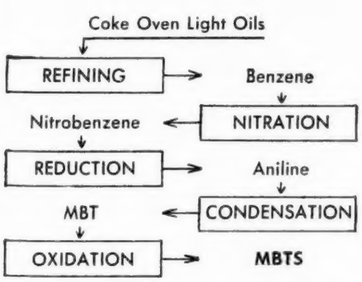
MBTS has occupied a major position among organic accelerators for over twenty years. Its all-round effectiveness has been proved by the fact that, despite the advent of newer accelerators with more delayed action, volume sales of MBTS have continued to grow year by year.

MBTS is 2-benzothiazolyl disulfide. A cream to light gray-white free-flowing powder, it possesses excellent



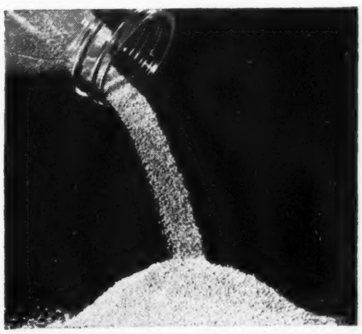
storage stability at moderate temperatures and is basically non-toxic under ordinary conditions of industrial usage.

Although consumer raw material specifications normally require a minimum of 91% MBTS, Cyanamid MBTS consistently analyzes about 93% in purity... the purest commercial grade on the market. This is achieved by careful quality control at each step, from raw materials to the finished product. Particle size is limited to a narrow predetermined range, insuring a high degree of batch-to-batch uniformity.



Starting from coke oven light oils, Cyanamid controls each production step to the final product.

Cyanamid MBTS is available both as a powder and as MBTS Pellets. In its powder form, effective protection against dusting is given by an efficient particle-coating additive, and the absence of fines and agglomerates means that it remains free-flowing even after prolonged storage. Where automatic compounding is used, however, many compounders prefer a formed type of MBTS as a means of reducing dusting, bridging and material-loss problems.



MBTS Pellets were developed especially to meet this need. Apart from their other advantages, they offer the same easy dispersion characteristics as regular Cyanamid MBTS powder, and can be incorporated without difficulty during mill or Banbury mastication.

MBTS has proved its economy and versatility in a wide range of white, black and colored stocks. A typical white rubber formulation is given below.

Pale Crepe	100
Whiting	40
Calcene T	40
Unitane® Titanium Dioxide	20
Zinc Oxide	5
Stearic Acid	1
Sulfur	2.85
MBTS	1.25

This formulation shows a Mooney Scorch time of 29-30 minutes at 250°F. Curing for 15 minutes at 286°F produces a Rex Hardness of 60. The stock, cured 30 minutes at the same temperature, gives a tensional creep of 15.8% in 22 hours at 212°F with 50 psi load. This result shows that MBTS gives reasonably good aging properties even in the absence of an antioxidant. For the best aging qualities, however, the use of a non-staining, non-discoloring antioxidant such as Cyanamid's Antioxidant 2246® is recommended. Where processing conditions allow, MBTS may be used in combination with activators or other delayed-action accelerators to provide the greatest economy as well as good processing safety.

As an added convenience to customers, Cyanamid MBTS is vacuum-packaged to insure neat, full packages that handle easier, minimize tear risks and reduce the storage space needed. Waste motion and waste space are also minimized by palletizing 50-lb. bags in compact unit loads of 2000 lb. each. In many cases, warehouse or storage space has been reduced by as much as 20%.

General chemical and physical properties, compounding characteristics, and illustrations of MBTS activity in a variety of natural and synthetic rubber stocks are detailed in Rubber Chemicals Technical Bulletin No. 839. Ask your Cyanamid Rubber Chemicals representative for a copy, or write direct to American Cyanamid Company, Rubber Chemicals Department, Bound Brook, New Jersey.

Market Reviews

	Eastern Points	Akron, O.
	Per Net Ton	
Mixed auto tires	$11.00	$12.00
S. A. G. truck tires	nom.	15.50
Peeling, No. 1	nom.	23.00
2	nom.	20.00
3	nom.	15.50
Tire buffings	nom.	nom.
	(¢ per Lb.)	
Auto tubes, mixed	2.50	2.75
Black	6.25	6.25
Red	6.25	6.25
Butyl	3.50	3.625

Reclaimed Rubber

The period during July 16-August 15 were reported to have been rather quiet for the reclaim market owing to the number of vacations in the plants which use this product. One source indicated that it does not expect any increase in the demand for reclaim until production of the 1959 model automobiles gets under way.

According to The Rubber Manufacturers Association, Inc., report, July production of reclaimed rubber reached 19,200 long tons; while consumption was 19,000 long tons.

Reclaimed Rubber Prices

Whole tire, first line	$0.11
Third line	.1025
Inner tube, black	.16
Red	.21
Butyl	.14
Light carcass	.22
Mechanical, light-colored, medium gravity	.155
Black, medium gravity	.085

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity, at special prices.

Rayon and Nylon

Rayon tire cord and fabric output in the second quarter fell 13% below production in the previous quarter and 30% below output in the same period in 1957. The big drop in production compared to the same period in the previous year took place in rayon tire cord and fabric output which declined from 79,232,000 pounds in the second quarter of 1957 to 47,918,000 pounds in the same period this year. Nylon tire cord and fabric output meanwhile remained just about at the same level, totaling 22,149,000 pounds in the second quarter of 1957 and 22,609,000 pounds in the 1958 period.

Total packaged production of rayon and acetate filament yarn during July was 52,000,000 pounds, consisting of 19,000,000 pounds of high-tenacity rayon yarn and 33,000,000 pounds of regular-tenacity rayon yarn. For June, production had been: total, 47,300,000 pounds, including regular-tenacity rayon yarn, 30,700,000; high-tenacity rayon yarn, 16,600,000 pounds.

Filament yarn shipments to domestic consumers for July totaled 52,400 pounds, of which 21,400,000 pounds were high-tenacity rayon yarn and 31,000,000 pounds were regular-tenacity rayon yarn. June shipments had been: total, 48,900,000 pounds; high-tenacity, 16,800,000 pounds; regular-tenacity, 32,100,000 pounds.

Stocks on July 31 totaled 66,000,000 pounds, made up of 16,800,000 pounds of high-tenacity rayon yarn and 49,200,000 pounds of regular-tenacity rayon yarn. End-of-June stocks had been: total, 67,300,000 pounds; high-tenacity rayon yarn, 19,600,000 pounds; regular-tenacity rayon yarn, 47,700,000 pounds.

Rayon Prices

Tire Fabrics	
1100/490/2	$0.69 /$0.73
1650/908/2	.63 / .725
2200/980/2	.625/ .655
Tire Yarns	
High-Tenacity	
1100/ 490, 980	.50/ .64
1100/ 490	.59/ .63
1150/ 490, 980	.59/ .63
1165/ 480	.59/ .65
1230/ 490	.59/ .63
1650/ 720	.55/ .58
1650/ 980	.55/ .58
1875/ 980	.55/ .58
2200/ 960	.54/ .57
2200/ 980	.54/ .57
2200/1466	.64
4400/2934	.60
Super-High Tenacity	
1650/ 720	.58
1900/ 720	.58

Nylon Prices

Tire Yarns	
840/ 140	$1.10/$1.20
1680/ 280	1.20

Industrial Fabrics

Toward the close of the July 16-August 15 period, after several weekly periods of progressively broader trade improvements in industrial grey cotton goods, the situation quieted somewhat. With many more contracts booked and mill production backlogs materially increased, the trade morale has been gaining right along. All are making efforts to improve the price structure. Progress in this direction has been made, but there remain numerous soft spots for lack of enough demand or excess yardages whose disposal dominates such specific constructions.

There are industrial grey cottons which until recently were plentiful and weak in price. Since then yardage liquidations have effected correctives for the previous oversupplies. Looms have been taken off these cloths at distress prices and at present scarcity looms where surpluses prevailed.

Another feature has developed. It involves the purpose of taking advantage of the opportunity to shift from slow and low-price cloths to others showing sounder manufacturing cost margins. Here a new danger, it is felt, lurks. By raising prices with the help of eliminated over-production and exhausted quick goods, the temptation has been presented to shift looms to the production of what looks better by comparison. An example are the wide drills, which have come out for last quarter at below the firm current quotations.

Scattered business has arisen from the ounce duck users, including tarpaulin and truck cover users. Shortages exist in some goods used by car-top makers of converted goods. Automobile cloth coaters are a little busier but not altogether as much as they will be when new 1959-car model production is set in full motion. Shoe makers have been in for small lots, some for irregular quality; also rubber product sources have bought a little.

Industrial Fabrics

Broken Twills*		
54-inch, 1.14, 76x52 ... yd.	$0.52	
58-inch, 1.06, 76x52	.56	
60-inch, 1.02, 76x52	.5825	
Drills*		
59-inch, 1.85, 68x40 ... yd.	.33	
2.25, 68x40	.28	
Osnaburgs*		
40-inch, 2.11, 35x25 ... yd.	.2275	
3.65, 35x25	.1525	
59-inch, 2.35, 32x26	.255	
62-inch, 2.23, 32x26	.275	
Ducks		
Enameling Ducks*	S. F.	D. F.
38-inch, 1.78 yd.	$0.3263	.3313
2.00 yd.	.275	.28
51.5-inch, 1.35 yd.	.4375	.445
57-inch, 1.22 yd.	.4838	.50
61.5-inch, 1.09 yd.	.5413	.5538
Army Duck†		
52-inch, 11.70 oz., 54x40 (8.10 oz./sq.yd.) ... yd.	.5925	
Numbered Duck†		
List less 40%		
Hose and Belting Duck*		
Basis ... lb.	.63	
Sheeting*		
40-inch, 3.15, 64x64 ... yd.	.2175	
3.60, 56x56	.185	
52-inch, 3.85, 48x48	.2275	
57-inch, 3.47, 48x48	.24	
60-inch, 2.10, 64x64	.36	
2.40, 56x56	.31	
Sateens*		
53-inch, 1.12, 96x60 ... yd.	.56	
1.32, 96x64	.51	
57-inch, 1.04, 96x60	.615	
58-inch, 1.02, 96x60	.62	
1.21, 96x64	.57	
Chafer Fabrics*		
14.40-oz./sq.yd. P.Y. ... yd.	.73	
11.65-oz./sq.yd. S.Y.	.61	
10.80-oz./sq.yd. S.Y.	.6575	
8.9-oz./sq.yd. S.Y.	.67	
40-inch, 2.56, 35x25	.25	
60-inch, 1.71, 35x25	.435	

*Net 10 days.
†2% 10 days.

News from Abroad

(Continued from page 924)

the price of rubber.

Meanwhile, the rise in the price of rubber in July above the 80 cents-a-pound level, which was maintained during the first week of August, has occasioned some speculation as to the possible effects on wage negotiations, if the price holds for three months. According to the agreement hitherto in force, wages for tappers would go up 30 cents (Straits) a day if the average price for the third quarter of 1958 worked out at more than 80 cents per pound.

Italy

Figures for rubber consumption by Italy during the period 1955-1957, inclusive, show a progressive increase in the consumption of synthetic rubber, accompanied by a decline of that in natural rubber. Whereas 13,000 tons out of a total of 70,000 tons of rubber used in 1955 were synthetic rubber, in 1956 the share of synthetic rubber out of the same total was 15,000 tons, and last year it was 20,000 tons out of a total of 73,000 tons.

The Ravenna factory of the ANIC (Azienda Nazionale Idrocarburi—a subsidiary of the state-owned Ente Nazionale Idrocarburi) is expected to begin producing styrene-butadiene rubber before the end of 1958. Initial output is to be at the rate of 35,000 tons a year, but when a new installation for converting butane to butadiene gets started, production capacity is expected to go up to 55,000 tons. As basic material, ANIC will use natural gas, of which large amounts are available in the Po valley. The use of methane in petrochemistry has developed considerably in Italy too and, as far as acetylene production is concerned, is said to have attained a level which compares favorably with that of the United States.

The steps in the production of synthetic rubber used at Ravenna are: production from acetylene of acetaldehyde, dehydrogenation to butadiene, copolymerization with styrene at a low temperature (cooling by ammonia), using as catalyst an initiator and activating mixture, as in the Phillips process. This Italian synthetic rubber is known as Europrene.

France

Official statistics reveal an increase in French tire production from 205,040 tons in 1956 to 220,300 tons last year. Average monthly output of 18,360 tons in 1957 compared with 17,090 tons the year before.

Synthetic Rubbers and Latices*

Monomers

11-80, 100, 200, 112-3 Triols	lb.	$0.255
11-300	lb.	.265
11-400	lb.	.325
Acrylonitrile	lb.	.27
Butadiene	lb.	.15
Dow Styrene N99, H99	lb.	.205
RG	lb.	.17
Vinyltoluene	lb.	.17
EGD	lb.	1.75 / $2.00
Hylene M	lb.	1.75 / 3.25
M-50	lb.	1.00 / 2.50
T	lb.	1.10 / 2.65
TM	lb.	.95 / 2.50
-65	lb.	1.00 / 2.55
Isobutylene	gal.	.38
Isoprene	lb.	.25
Mondur-C	lb.	1.05
Monomer MG-1	lb.	1.00 / 1.25
-S	lb.	.85
MPL	lb.	1.75 / 2.00
Multron R-2	lb.	.54
P200	lb.	.23
Rohm & Haas ethyl acrylate	lb.	.34 / .36
Glacial methacrylic acid	lb.	.45 / .47
Methyl acrylate	lb.	.37 / .39
Methacrylate	lb.	.29 / .31

Shortstops

DDM	lb.	.88 / .915
Mercaptan 174	lb.	.38 / .50
Sharstop	lb.	.33 / .37
268	lb.	.52 / .53
Tecquinol	lb.	.825 / .845
Thiostop K	lb.	.50 / .53
N	lb.	.38 / .47
Vulnapol KM	lb.	.52 / .53
NM	lb.	.38 / .42
Wingstop B	lb.	.38

Acrylic Types

Acrylon BA-15 lb.	1.25[a]
EA-5 lb.	1.00[a]
Hycar 4021	1.34[c] / 1.35[c]

Latices

Hycar 2600X30, 2600X39, 2601 lb.	.50 / .56

Fluorocarbon Types

Kel-F Elastomer lb.	15.00 / 16.00
5500, 820 (Latex) lb.	15.00 / 17.15
Viton A, AHV lb.	15.00

Isobutylene Types

Enjay Butyl 035, 150, 215, 065 217, 218,...	.23[a]
325, 165, 268, 365	.24[a]
Hycar 2202	.65[c] / .75[c]
Polysar Butyl 100, 200, 300, 400	.245[c]
101	.2775[a]
301	.255[c]
Vistanex LM	.45[a]
MM	.35[a]

Neoprene Types (CR)

Neoprene Type AC, AD, CG	.55[a]
GN, GN-A, WX	.41[a]
GRT, S	.42[a]
KNR	.75[a]
W, WHV	.39[a]
WRT	.45[a]

Latices

Neoprene Latex 571, 842-A	.37[a]
572	.39[a]
60, 601-A	.40[a]
635	.41[a]
650	.42[a] / .53[a]
735, 736	.38[a]
750	.39[a] / .50[a]
950	.47[a]

Nitrile Types

Butaprene NF	.49[b]
NH	.65[b]
NL	.50[b]
NXM	.58[b]
Chemigum N1	.64[b]
N3 N5	.58[b]
N6, N-6B, N7, N8	.50[b]
Hycar 1001, 1041	.58[c] / .59[c]
1002, 1042, 1043, 1052, 1053, 1312	.50[c] / .51[c]
1014	.60[c] / .61[c]
1072	.64[c] / .65[c]
1411	.62[c] / .63[c]
1432, 1441	.59[c] / .60[c]
Paracril AJ	.485[c]
B, BJ, BJLT, BLT	.51[c]
C, CLT	.59[c]
CV	.60[c]
D	.65[c]
18-80	.60[c]
Polysar Krynac 800, 802, 803	.50[c]
801	.58[c]

Latices

Butaprene N-300	$0.46[b]
N-400, N-401	.54[b]
Chemigum 200	.49[b]
235 CHS, 236	.54[b]
245 B, 245 CHS, 246, 247, 248	.46[b]
Hycar 1512, 1552, 1562, 1577	$0.46[c] / .52[c]
1551, 1561, 1571	.54[c] / .60[c]
1852	.46[c] / .52[c]
Nitrex 2612, 2614	.46[a]
2615	.51[a]

Polyethylene Type

Hypalon 20, 30 lb.	.70

Polysulfide Types

Thiokol LP-2, -3, -31, -32, -33	.96[a]
-8	1.35[a]
-205	4.00[a]
Type-A	.50[a]
FA	.69[a]
ST	1.25[a]

Latices

Thiokol Latex (dry wt.) Type MX	.80[a]
WD-2	1.25[a]
-6	.80[a] / 1.25[a]

Silicone Types

GE (compounded)	2.29[c] / 4.90[c]
Silicone gum (not compounded)	3.85[c] / 4.55[c]
Silastic (compounded)	2.95[b] / 3.50[b]
(Partly compounded)	3.15[b] / 3.60[b]
(Uncompounded)	4.05[b] / 4.35[b]
LS-53	22.00[b]
Union Carbide (compounds)	2.35[b] / 3.20[b]
(Gums)	3.85[b] / 4.25[b]

Styrene Types

Hot SBR‡

Ameripol 1000, 1001, 1006, 1007	.241[c] / .247[c]
1006 Crumb	.2475[c] / .2535[c]
1002	.2435[c] / .2495[c]
1009	.2475[c] / .2535[c]
1011	.2475[c] / .2610[c]
1012	.2425[c] / .2485[c]
Crumb	.254[c] / .26[c]
1013	.25[c] / .2560[c]
ASRC 1001, 1004, 1006, 1009	.241[c] / .2475[c]
1018	.270[c]
1019	.265[c]
FR-S 1000, 1001, 1004, 1006	.241[c] / .247[c]
1009	.2475[c] / .2535[c]
1010	.26[c] / .266[c]
1012	.2425[c] / .2485[c]
1013	.25[c] / .256[c]
1014	.281[c] / .287[c]
1015	.291[c] / .297[c]
Naugapol 1016, 1019	.265[b]
1018	.27[b]
1021	.30[b]
1022	.28[b]
1023	.285[b]
Philprene 1000, 1001, 1006	.241[b]
1009	.2475[b]
1010	.26[b]
1018	.27[b]
1019	.265[b]
Plioflex 1006	.241[c]
Polysar S, S-50	.241[c]
S-X-371	.255[c]
S-1001, -1006, -1013	.23[a]
-1002, -1011	.2325[a]
-1009	.24[a]
Synpol 1000, 1001, 1006, 1007, 1061	.241
1002	.2435[b]
1012	.2425[b]
1009	.2475[b]
1013	.25[b]

Hot SBR Black Masterbatch

Philprene 1100	.194
1104	.190[b]
S-1100	.185[a]

Cold SBR

Ameripol 1500, 1501, 1502	.241[c] / .247[c]
ASRC 1500, 1502	.241[c]
1503	.2625[c]
Copo 1500, 1502	.241[c] / .247[c]
1505	.261[c] / .267[c]
FR-S 1500, 1502	.247[c]
Naugapol 1503	.2625[b]
1504	.295[b]
Philprene 1500, 1502	$0.241[b]
1503	.2625[b]
Plioflex 1500, 1502	.241[c]
Polysar Kryflex 200	.251[c]
SS-250, SS-250-Flake	.2875[c]
Krylene, NS	.241[a]
S-1500, S-1502-S	.23[a]
S-1506	.25[a]
Synpol 1500, 1502, 1551	.241[b]

Cold SBR Black Masterbatch

Baytown 1600, 1601, 1602	.193[b]
Philprene 1600, 1601	.193[b]
1605	.19[b]
S-1600, -1601, -1602	.1825[a]

Cold SBR Oil Masterbatch

Ameripol 1703	$0.206[c] / .212[c]
1705	.2035[c] / .2095[c]
1707, 1708	.191[c] / .197[c]
1710, 1712	.1885[c] / .1945[c]
ASRC 1703	.206[c]
1708	.191[c]
Copo 1712	.1885[c] / .1945[c]
1773	.206[c] / .212[c]
1778	.191[c] / .197[c]
FR-S 1703	.206[c] / .212[c]
1705	.2035[c] / .2095[c]
1712	.1885[c] / .1945[c]
Philprene 1703	.206[b]
1706	.203[b]
1708	.191[b]
1712	.1885[b]
Plioflex 1703, 1773	.206[c]
1710, 1712	.1885[c]
1778	.191[c]
Polysar Krynol 65	.1885[c]
652	.191[c]
S-1703	.195[a]
-1706	.1925[b]
-1707	.18[a]
-1709, -1712	.1775[a]
Synpol 1703	.206[b]
1707, 1708	.191[b]
1711	.19[b]
1712	.1885[b]

Hot SBR Latices

FR-S 2000, 2001	.2725[c] / .3425[c]
2002, 2003, 2004	.35[c] / .36[c]
2006	.29[c] / .382[c]
Naugatex 2000, 2001, 2006	.263[a]
2002	.288[a]
2005	.30[a]
Pliolite Latex 2000, 2001	.2825[c]
2076	.295[c]
Polysar Latex II	.29[c]
IV	.2775
S-2000	.2275[a]
2006	.215[a]

Cold SBR Oil-Black Masterbatch

Baytown 1801	.176[b]
Philprene 1803	.174[b]
S-1803	.165[a]
-1804	.175[a]

Cold BR Latex‡

Copo 2101, 2108	.30[c] / .4025[c]
2102, 2105, 2110	.32[c] / .3725[c]
FR-S 2105	.366[c]
Naugatex 2101	.285[a]
2105	.312[a]
X-767	.323[a]
Polysar Latex 721	.32[c]
Pliolite Latex 2101	.30[c]
2105, 2107	.32[c]
2108	.30[c]
S-2101	.225[a]
-2105	.31[a]
-2107	.32[a]

Cold BR Latex§

Pliolite Latex 2104	.325[c]

* Prices are per pound carload or tank-car dry weight unless otherwise specified.
[a] Freight extra.
[b] Minimum freight allowed.
[c] Freight prepaid.
‡SBR —Styrene-butadiene rubber.
§BR —Butadiene rubber.

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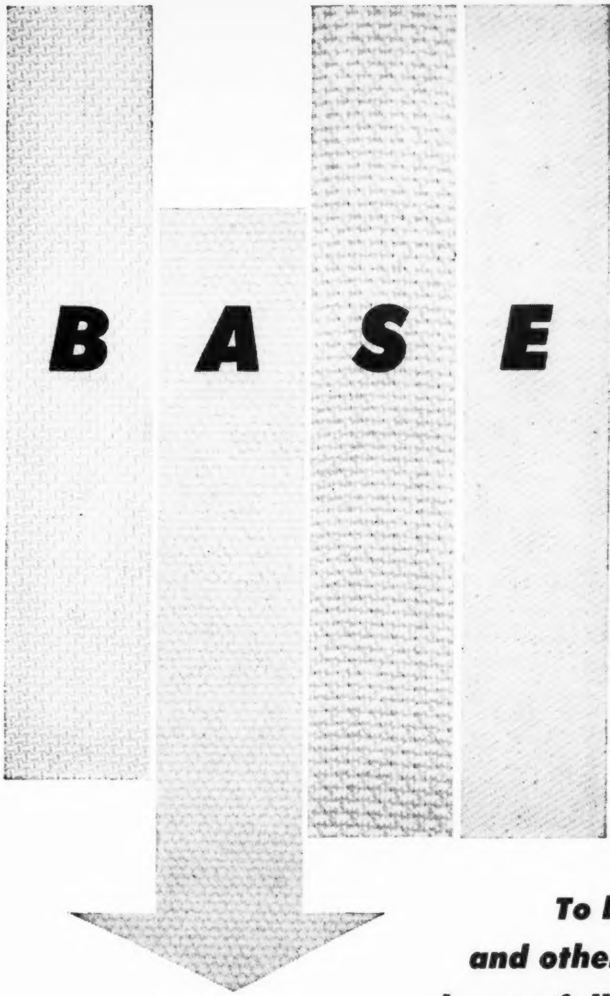
E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., has announced that its Hylene organic isocyanates are being used to make urethane foams which have found applications as thick, soft tractor seats. Urethane foam, which is extremely lightweight, strong, and resilient, is now being used to cushion seats of tractors produced by Massey-Ferguson, Inc. The foam was subjected to extensive physical and environmental testing before being approved by Massey-Ferguson.



a BASE fabric's work is only as good as its bond!

To bond well with plastic, rubber and other materials, base fabrics must be carefully selected for the specific job

The success of end products made through the coating, laminating, combining or frictioning of a fabric often depends on how well that base fabric bonds or unites with the vinyl, neoprene, natural rubber, phenolic resins, etc.

At Wellington Sears, many factors are considered in choosing a base fabric. These are related to the job to be done, and the materials to be united with the fabric. Some are: fiber affinity for these materials; form in which fiber and yarn are used; effect of yarn twist, thread count, fabric sizing, and special fabric treatments. Further, the base fabric must meet requirements as to flexibility, strength, weight and other characteristics before it gets a final okay. With such care (and a century of experience) working for you, you're in good hands whenever you take your working-fabric problems to Wellington Sears! For informative booklet, "Fabrics Plus," write Dept. H-9.

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Compounding Ingredients*

Abrasives

Pumicestone, powdered	lb.	$0.0363/	$0.065
Rottenstone, domestic	lb.	.03 /	.04
Shelblast	ton	80.00 /	165.00
Walnut Shell Grits	ton	50.00 /	160.00

Accelerators

A-1 (Thiocarbanilide)	ton	.50 /	.57
A-32	ton	.66 /	.80
A-100	lb.	.52 /	.66
Accelerator 49		.59 /	.60
52	lb.	1.14	
57, 62, 67, 77	lb.	1.04	
66	lb.	4.25	
89	lb.	1.20	
108	lb.	.92 /	.97
552	lb.	2.25	
808	lb.	.66 /	.68
833	lb.	1.17 /	1.19
Altax	lb.	.54 /	.56
Arazate	lb.	2.25 /	2.30
Beutene	lb.	.66 /	.71
Bismate	lb.	3.00	
B-J-F	lb.	.27 /	.32
Butasan	lb.	1.04	
Butazate	lb.	1.04 /	1.09
Butyl Accelerator Eight	lb.	1.35	
Namate	lb.	.45 /	.50
Zimate	lb.	1.04	
Ziram	lb.	.89 /	1.04
Captax	lb.	.44 /	.46
C-P-B	lb.	1.95 /	2.00
Cumate	lb.	1.45	
Dibs	lb.	.85	
Diesterex N		.50 /	.57
Dipac	lb.	.85	
DOTG (diorthotolylguanidine)			
Cyanamid	lb.	.64 /	.65
Du Pont	lb.	.62 /	.63
DPG (diphenylguanidine)			
Cyanamid	lb.	.49 /	.50
Monsanto	lb.	.52 /	.58
El-Sixty	lb.	.62 /	.64
Ethasan	lb.	1.04	
Ethazate	lb.	1.04 /	1.09
50-D	lb.	.87 /	.92
Ethyl Seleram	lb.	3.00	
Thiurad	lb.	1.04	
Thiram	lb.	1.04	
Tuads	lb.	1.04	
Tuex	lb.	1.04 /	1.09
Zimate	lb.	1.04	
Ziram	lb.	.89 /	1.04
Ethylac #650	lb.	.93 /	.95
Guantal	lb.	.60 /	.67
Hepteen	lb.	.44 /	.50
Base	lb.	1.85 /	1.90
Ledate	lb.	1.04	
MBT (2-mercaptobenzothiazole)			
American Cyanamid	lb.	.44 /	.46
Du Pont	lb.	.42 /	.44
Naugatuck	lb.	.44 /	.49
-XXX, Cyanamid	lb.	.55 /	.57
MBTS (mercaptobenzothiazyl disulfide)			
Cyanamid	lb.	.54 /	.56
Du Pont	lb.	.52 /	.54
Naugatuck	lb.	.54 /	.59
-W Cyanamid	lb.	.59 /	.61
Merac #225	lb.	.75 /	1.05
Mertax	lb.	.55 /	.57
Methasan	lb.	1.04	
Methazate	lb.	1.04 /	1.09
Methyl Thiram	lb.	1.14	
Tuads	lb.	1.14	
Zimate	lb.	1.04	
Monex	lb.	1.14 /	1.19
Mono-Thiurad	lb.	1.14	
2-MT (2-mercaptothiazoline)			
Cynamid	lb.	.88 /	.90
Du Pont	lb.	1.00	
NOBS No. 1	lb.	.76 /	.78
Special	lb.	.80 /	.82
O-X-A-F	lb.	.55 /	.60
Pennac SDB	lb.	.45 /	.48
Pentex	lb.	1.24 /	1.29
Flour	lb.	.30 /	.35
Permalux	lb.	2.17	
Phenex	lb.	.52 /	.59
Pip-Pip		2.07	
R-2 Crystals	lb.	4.35	
Rotax	lb.	.55. /	.57
RZ-50, -50B	lb.	1.00	
S. A. 52	lb.	1.14	
57, 62, 67, 77	lb.	1.04	
66	lb.	3.00	
Santocure	lb.	.76 /	.78
NS	lb.	.80 /	.82
Selenacs	lb.	3.00	
SPDX-GH	lb.	.69 /	.74
GL	lb.	1.20 /	1.34
Sulfads	lb.	1.98	
Tellurac	lb.	1.30 /	1.55
Tepidone	lb.	.45 /	.48
Tetrone A	lb.	1.91	
Thiates	lb.	.88 /	1.25
Thiofide	lb.	.54 /	.56
S	lb.	.64 /	.66
Thionex	lb.	1.14	
Thiotax	lb.	.44 /	.46
Thiurad	lb.	1.14	
Thiuram E	lb.	1.04	
M	lb.	1.14	
Trimene	lb.	$0.56 /	$0.62
Base	lb.	1.03 /	1.10
Tuex	lb.	1.14	
Ultex	lb.	1.00 /	1.10
Unads	lb.	1.14	
Ureka Base	lb.	.66 /	.73
Vulcacure NB	lb.	.45	
NS	lb.	.75 /	1.05
ZB, ZE, ZM	lb.	.85 /	.89
Z-B-X	lb.	2.45 /	2.50
Zenite	lb.	.52 /	.54
A	lb.	.62 /	.64
Special	lb.	.53 /	.55
Zetax	lb.	.51 /	.53
Zimate	lb.	1.04	

Accelerator-Activators, Inorganic

Lime, hydrated	ton	21.96	
Litharge, comml.	lb.	.1375/	.18
Eagle, sublimed	lb.	.1385	
National Lead, sublimed	lb.	.1385	
Red lead, comml.	lb.	.185 /	.195
Eagle	lb.	.1425	
National Lead	lb.	.1425	
PRD-90	lb.	.38 /	.50
White lead, carbonate	lb.	.19 /	.20
Eagle	lb.	.165 /	.175
National Lead	lb.	.175 /	.185
Silicate	lb.	.1725/	.1825
Eagle	lb.	.155 /	.2075
National Lead	lb.	.16 /	.17
Zinc oxide, comml.†	lb.	.145 /	.1925

Accelerator-Activators, Organic

Aktone	lb.	.2125/	.2325
Barak	lb.	.62	
Capital 170	lb.	.20 /	.25
171	lb.	.1425/	.1925
255, 258, 710	lb.	.14 /	.19
270	lb.	.1175/	.1425
261	lb.	.155 /	.18
262	lb.	.16 /	.185
263	lb.	.1775/	.2025
Curade	lb.	.57 /	.59
D-B-A	lb.	1.95	
Emery 600	lb.	.1425/	.1925
G-M-F	lb.	2.60 /	2.65
PDD-70	lb.	2.70 /	3.00
PGD-25	lb.	1.25 /	1.50
Groco 30	lb.	.1425/	.1925
35	lb.	.1475/	.1975
Guantal	lb.	.62 /	.64
Hyfac 410	lb.	.145 /	.17
430	lb.	.18 /	.205
431	lb.	.2025/	.2275
Hystrene S-97	lb.	.1863/	.2125
T 45	lb.	.1638/	.19
T-70	lb.	.1738/	.20
Industrene B	lb.	.1263/	.1525
R	lb.	.1138/	.14
158	lb.	.1313/	.1575
254	lb.	.1413/	.1675
262	lb.	.1513/	.1775
Laurex	lb.	.34 /	.38
MODX	lb.	.295 /	.345
NA 22	lb.	1.00	
PND-70	lb.	1.35 /	1.60
Oleic acid, comml.	lb.	.185 /	.225
Emersol 210 Elaine	lb.	.14 /	.19
Groco 2, 4, 8, 18	lb.	.14 /	.19
Plastone	lb.	.27 /	.30
Polyac	lb.	1.85	
Ridacto	lb.	.25 /	.26
Seedine	lb.	.1485/	.1703
Stearex Beads	lb.	.1488/	.1588
Stearic acid			
Emersol 120	lb.	.16 /	.185
150	lb.	.1875/	.2125
Hydrofoil 51	lb.	.09	
Hydrogenated, rubber grd.			
Groco 56	lb.	.1175/	.1425
Rufat 75	lb.	.1062/	.1325
Single pressed, comml.	lb.	.1475/	.1675
Emersol 110	lb.	.165 /	.19
Groco 53	lb.	.155 /	.18
Wilmar 253	lb.	.1525/	.1775
Double pressed, comml.	lb.	.1525/	.1725
Groco 54	lb.	.16 /	.185
Wilmar 254	lb.	.1575/	.1825
Triple pressed, comml.	lb.	.175 /	.195
Groco 55	lb.	.1775/	.2025
Wilmar 255	lb.	.1875/	.2125
Sterene 60-R	lb.	.09 /	.1075
Tonox	lb.	.515 /	.605
Vimbra	lb.	.32 /	.385
Vulklor	lb.	.88 /	1.08
Wilmar 110	lb.	.17 /	.22
434	lb.	.1425/	.1925
Zinc stearate, comml.	lb.	.39 /	.44

Antioxidants

AC-1	lb.	.37 /	.86
-5	lb.	1.49 /	1.63
AgeRite Alba	lb.	$2.40 /	$2.50
Gel	lb.	.70 /	.72
H. P.	lb.	.79 /	.81
Hipar	lb.	1.05 /	1.07
Powder	lb.	.57 /	.59
Age Resin	lb.	.88 /	.90
D	lb.	.57 /	.59
Spar	lb.	.57 /	.59
Stalite	lb.	.57 /	.59
S	lb.	.57 /	.59
Superlite	lb.	.57 /	.59
White	lb.	1.50 /	1.60
Akroflex C	lb.	.81 /	.83
CD	lb.	.76 /	.78
Albasan	lb.	.69 /	.73
Allied AA 1144	lb.	.23 /	.24
AA-1177	lb.	.155 /	.165
Aminox	lb.	.57 /	.62
Antioxidant 425	lb.	2.47 /	2.50
2246	lb.	1.50 /	1.53
Antisol	lb.	.23 /	.24
Antisun	lb.	.15 /	.51
Antox	lb.	.55 /	.57
Aranox	lb.	3.25 /	3.30
Betanox Special	lb.	.91 /	.96
B-L-E, -25	lb.	.57 /	.62
Burgess Antisun Wax	lb.	.185	
B-X-A	lb.	.55 /	.60
Catalin AC-5	lb.	1.49 /	1.63
Copper Inhibiter X-872-L	lb.	2.01	
D-B-P-C	lb.	.91 /	1.16
Deenax	lb.	.95	
Flectol H	lb.	.57 /	.59
Flexamine	lb.	.79 /	.84
Heliozone	lb.	.31 /	.32
Ionol	lb.	.91 /	1.65
Microflake	lb.	.20 /	.24
Naugawhite	lb.	.57 /	.62
NBC	lb.	1.55	
Neozone A	lb.	.59 /	.61
C	lb.	.83	
D	lb.	.55 /	.57
Nevastain A	lb.	.51 /	.61
B	lb.	.51 /	.70
Octamine	lb.	.57 /	.62
PDA-10	lb.	.46 /	.48
Perflectol	lb.	.61 /	.68
Permalux	lb.	2.17 /	
Polygard	lb.	.57 /	.62
Polylite	lb.	.55 /	.60
Protector	lb.	.26 /	.31
Rio Resin	lb.	.60 /	.62
Santoflex 35	lb.	.72 /	.79
75	lb.	1.01 /	1.03
AW	lb.	.71 /	.78
B	lb.	.52 /	.59
BX	lb.	.63 /	.70
DD	lb.	.57 /	.59
Santovar A	lb.	1.55 /	1.57
Santowhite Crystals, Powder	lb.	1.55 /	1.62
L	lb.	.57 /	.59
MK	lb.	1.25 /	1.32
Stabilite	lb.	.55 /	.59
Alba	lb.	.72 /	.79
L	lb.	.60 /	.64
White	lb.	.52 /	.60
Powder	lb.	.41 /	.47
Styphen I	lb.	.51 /	.55
Sunolite #100	lb.	.21 /	.23
#127	lb.	.17 /	.19
Sunproof-713	lb.	.26 /	.31
Improved	lb.	.25 /	.30
Jr.	lb.	.22 /	.27
Tenamene 3	lb.	.91 /	1.05
Thermoflex	lb.	1.00 /	1.02
Tonox	lb.	.54 /	.59
Tysonite	lb.	.24 /	.2475
Velvapex 51-250	lb.	.40 /	
V-G-B	lb.	.75 /	.80
Wing-Stay S	lb.	.55 /	.67
Zalba	lb.	1.10	
Zenite	lb.	.52 /	.54

Antiozonants

Eastozone 30, 31	lb.	1.05 /	1.09
32	lb.	1.70 /	1.72
Tenamene 30, 31	lb.	1.24 /	1.28
UOP 88, 288	lb.	1.05 /	1.07

Antiseptics

Copper naphthenate, 6-8%	lb.	.245	
Pentachlorophenol	lb.	.22 /	.30
Resorcinol, technical	lb.	.775 /	.785
Zinc naphthenate, 8-10%	lb.	.245 /	.30

Blowing Agents

Ammonium bicarbonate	lb.	.07 /	.09
Carbonate	lb.	.16	
Blowing Agent CP 1475	lb.	.32 /	.35
Celogen	lb.	1.95 /	2.00
50 C	lb.	1.01 /	1.07
Kempore R-125	lb.	1.95	
Opex 40	lb.	.76	
Sodium bicarbonate	100 lbs.	2.55 /	3.85
Carbonate, tech.	100 lbs.	1.35 /	5.52
Sponge Paste	lb.	.20	
Unicel ND	lb.	.76	
NDX	lb.	1.52	
S	lb.	.20	

Bonding Agents

Braze	gal.	6.00 /	9.00
Cover cement	gal.	2.50 /	4.00
Chemlok 201, 203	gal.	5.00 /	7.50
220	gal.	9.25 /	12.00
401	gal.	11.70 /	14.40

* Prices, in general, are f.o.b. works. Range indicates grade or quantity variations. No guarantee of these prices is made. Spot prices should be obtained from individual suppliers.

† For trade names, see Color—White, Zinc Oxides.

‡ At the request of the suppliers, the lowest prices shown for carbon blacks are for carloads in bags. Prices for hopper carloads are lower.

Chemlok 602	gal.	$25.00	$26.00
607	gal.	18.00	
614	lb.	4.35	4.75
Flocking Adhesive RFA17, RFA22, RFA25	lb.	.50	
G-E Silicone Paste SS-15	lb.	4.52	5.10
SS-64	lb.	3.65	6.75
-67 Primer	lb.	7.50	12.50
Gen-Tac Latex	lb.	.70	.805
Hylene M	gal.	3.50	3.75
M-50	gal.	1.90	2.15
Kalabond Adhesive	gal.	6.50	16.00
Tie Cement	gal.	2.00	5.60
Thixon	gal.	1.48	12.00
Ty Ply, BN, Q, S, UP, 3640	gal.	6.75	8.00
RC	gal.	3.75	5.00

Brake Lining Saturants

BRT 3	lb.	.018	.0265
Resinex L-S	lb.	.0225	.03

Carbon Blacks‡

Conductive Channel—CC

Continental R-40	lb.	.23	.30
Kosmos/Dixie BB	lb.	.23	.30
Spheron C	lb.	.18	.24
Voltex	lb.	.18	.315

Easy Processing Channel—EPC

Collocarb EPC	lb.	.059	.099
Continental AA	lb.	.074	.1225
Kosmobile 77/Dixiedensed 77	lb.	.074	.1225
Micronex W-6	lb.	.0725	.145
Spheron #9	lb.	.0775	.145
Texas E	lb.	.0775	.145
Witco #12	lb.	.074	.1225
Wyex EPC	lb.	.0775	.135

Hard Processing Channel—HPC

Continental F	lb.	.074	.1225
HX HPC	lb.	.074	.1225
Kosmobile S/Dixiedensed S	lb.	.074	.1225
Micronex Mk. II	lb.	.0775	.145
Witco #6	lb.	.074	.1225

Medium Processing Channel—MPC

Arrow MPC	lb.	.0775	.135
Continental A	lb.	.074	.1225
Kosmobile S-66/Dixiedensed S-66	lb.	.0775	.145
Micronex Standard	lb.	.0725	.145
Spheron #6	lb.	.0775	.145
Texas 109	lb.	.084	.1475
M	lb.	.0775	.145
Witco #1	lb.	.074	.1225

Conductive Furnace—CF

Aromex CF	lb.	.0875	.145
Vulcan C	lb.	.110	.175
SC	lb.	.18	.245
XC-72	lb.	.25	.33

Fast Extruding Furnace—FEF

Arovel FEF	lb.	.0675	.125
Continex FEF	lb.	.06	.10
Kosmos 50/Dixie 50	lb.	.06	.10
Philblack A	lb.	.0675	.115
Statex M	lb.	.0625	.125
Sterling SO	lb.	.0675	.125

Fine Furnace—FF

Statex B	lb.	.0675	.13
Sterling 99	lb.	.0725	.13

High Abrasion Furnace—HAF

Aromex HAF	lb.	.0775	.135
Continex HAF	lb.	.079	.125
Kosmos 60/Dixie 60	lb.	.079	.1175
Philblack O	lb.	.0775	.125
Statex R	lb.	.0725	.135
Vulcan #3	lb.	.0775	.135

Intermediate Super Abrasion Furnace—ISAF

Aromex ISAF	lb.	.0925	.15
Kosmos 70/Dixie 70	lb.	.10	.145
Philblack I	lb.	.0925	.14
Statex 125	lb.	.0875	.15
Vulcan 6	lb.	.0925	.15

Super Abrasion Furnace—SAF

Philblack E	lb.	.115	.1625
Statex 160	lb.	.11	.18
Vulcan 9	lb.	.115	.18

General-Purpose Furnace—GPF

Arogen GPF	lb.	.06	.1175
Statex G	lb.	.055	.1175
Sterling V	lb.	.06	.1175
V Non-staining	lb.	.06	.1175

High Modulus Furnace—HMF

Collocarb HMF	lb.	.045	.085
Continex HMF	lb.	.055	.095
Kosmos 40/Dixie 40	lb.	.055	.095
Modulex HMF	lb.	.0625	.12

Statex 93	lb.	$0.0575	$0.12
930	lb.	.047	.087
Sterling L, LL	lb.	.0625	.12

Semi-Reinforcing Furnace—SRF

Collocarb SRF	lb.	.042	.082
Continex SRF	lb.	.045	.085
Essex SRF	lb.	.0575	.115
Furnex	lb.	.0525	.115
Gastex	lb.	.0625	.125
Kosmos 20/Dixie 20	lb.	.045	.085
Pelletex, NS	lb.	.0575	.115
Sterling NS, S	lb.	.0575	.115
R	lb.	.0625	.125

Fine Thermal—FT

P-33	lb.	.0575	
Sterling FT	lb.	.0575	

Medium Thermal—MT

Sterling MT	lb.	.04	
Non-staining	lb.	.05	
Thermax	lb.	.04	
Stainless	lb.	.05	

Colors

Black

Iron oxides, comml	lb.	.1235	.135
BK—Lansco	lb.	.1275	.13
Williams	lb.	.145	
Lansco synthetic	lb.	.10	
Mapico	lb.	.1475	.15
Lampblack, comml	lb.	.16	.45
Superjet	lb.	.085	.12
Permanent Blue	lb.	.80	1.05
Stan-Tone	lb.	.45	1.20
Vansul masterbatch	lb.	.60	.65
Paste	lb.	.14	.15

Blue

Alkali Blue G, R	lb.	2.38	
C. P. Iran Blues	lb.	.52	.54
Du Pont	lb.	1.77	4.55
Filo	lb.	.28	
Heveatex pastes	lb.	.80	1.45
Lansco ultramarines	lb.	.25	.28
Monsanto Blue 7	lb.	1.55	
11	lb.	3.45	
DPB-283	lb.	1.93	
S-11	lb.	2.05	
Permanent Blue	lb.	.80	1.05
Stan-Tone Violet Blue D-4000	lb.	3.45	
4001	lb.	3.00	
4002	lb.	.90	
4900	lb.	1.97	2.15
Vansul masterbatch	lb.	.90	2.70

Brown

Filo	lb.	.13	
Iron oxides, comml	lb.	.1425	.145
Lansco synthetic	lb.	.125	
Mapico Brown	lb.	.1575	.16
Sienna, burnt, comml	lb.	.0425	.155
Williams	lb.	.115	.1775
Raw, comml	lb.	.045	.1325
Williams	lb.	.08	.1725
Umber, burnt, comml	lb.	.06	.07
Williams	lb.	.0725	.085
Raw, comml	lb.	.0625	.07
Williams	lb.	.07	.0825
Williams, pure brown	lb.	.155	
Vandyke	lb.	.12	
Mapico Tan	lb.	.2325	.235
Metallic Brown	lb.	.05	.06
Vansul masterbatch	lb.	2.10	2.20

Green

Chrome	lb.	.19	.50
Green	lb.	.80	2.40
Oxide	lb.	.3925	1.10
Cyanamid	lb.	.42	.44
Green G	lb.	3.50	3.95
Lincoln Green	lb.	5.30	6.60
G-4099, -6099	lb.	.4525	
GH-9869	lb.	1.10	1.25
9976	lb.	1.20	1.35
Du Pont	lb.	1.97	2.80
Filo	lb.	.40	
Heveatex pastes	lb.	.95	1.85
Lansco Toner	lb.	1.35	
Monsanto Green 3	lb.	2.75	
14	lb.	1.45	
17	lb.	3.95	
71205	lb.	1.35	
DGP	lb.	2.03	
S-17	lb.	2.25	
Stan-Tone D-5000	lb.	3.95	
5001	lb.	.82	
5400	lb.	1.45	
Vansul masterbatch	lb.	2.00	2.60

Orange

Cyanamid Permatons	lb.	1.50	1.56
Du Pont	lb.	2.75	
Monsanto Orange 68187	lb.	2.90	
Stan-Tone Light orange D-7003	lb.	3.97	4.17
70 PCO3	lb.	2.48	2.76
Orange 70 PCO4	lb.	2.80	3.08
D-7004	lb.	4.23	4.43
D-7104	lb.	1.85	2.05
Vansul masterbatch	lb.	2.00	2.60

Red

Antimony trisulfide	lb.	$0.285	$0.315
R. M. P. No. 3	lb.	.72	
Sulfur Free	lb.	.78	
Brilliant Toning Red	lb.	1.95	
Cadmium red lithopones	lb.	2.21	3.77
Cadmolith	lb.	1.72	2.20
Cyanamid	lb.	.93	1.90
Naphthol Red, Scarlet	lb.	2.95	3.80
Du Pont	lb.	1.47	1.90
Filo	lb.	.11	
Indian Red	lb.	.1275	
Iron oxide, comml	lb.	.06	.13
Lansco synthetic	lb.	.1175	
Mapico	lb.	.1425	.145
Recco	lb.	.12	
Williams Red	lb.	.13	.1525
Monsanto Maroon 113	lb.	1.50	
61148	lb.	1.75	
Red 7	lb.	1.55	
41	lb.	4.40	
3501	lb.	1.15	
4004	lb.	1.50	
69191	lb.	3.38	
Autumn	lb.	1.10	
PRP-285	lb.	1.27	
S-44	lb.	1.28	
Rub-Er-Red	lb.	.0975	
Stan-Tone D-2000	lb.	1.25	
2110, 2120, 2121	lb.	.98	
2200	lb.	1.47	
2500	lb.	1.90	
2600	lb.	4.60	
2601	lb.	1.60	
2700	lb.	1.75	
2800	lb.	1.90	
Light Red D-7005	lb.	4.68	4.88
D-7105	lb.	1.97	2.17
70 PCO5	lb.	3.00	3.28
Red D-7006	lb.	4.89	5.09
D-7106	lb.	2.20	2.40
70 PCO6	lb.	3.35	3.63
Vansul masterbatch	lb.	.95	3.30
Venetian	lb.	.04	.0675

White

Antimony oxide	lb.	.27	.285
Burgess Iceberg	ton	50.00	80.00
Cryptone BT	lb.	.10	.11
Permolith lithopone	lb.	.08	.087
Titanium pigments Horse Head Anatase	lb.	.255	.27
Rutile	lb.	.275	.29
Rayox LW	lb.	.195	.205
R-110	lb.	.215	.225
Ti-Cal	lb.	.075	.0825
Ti-Pure	lb.	.195	.225
Titanox A, AA, A-168	lb.	.255	.265
C-50	lb.	.1438	.1488
RA, -10, -50	lb.	.275	.285
RC	lb.	.0963	.1013
-HT, -HTX	lb.	.0963	.0988
Unitane	lb.	.255	.29
Zopaque Anatase	lb.	.245	.27
Rutile	lb.	.205	.29
Zinc oxide, comml	lb.	.145	.1825
Azo ZZZ-11, -44, -55	lb.	.145	.165
20% leaded	lb.	.1505	.1705
35% leaded	lb.	.155	.175
50% leaded	lb.	.1588	.1788
Eagle AAA, lead free	lb.	.145	.155
5% leaded	lb.	.145	.155
35% leaded	lb.	.1513	.1613
50% leaded	lb.	.1538	.1638
Florence Green Seal	lb.	.1625	.1725
Red Seal	lb.	.1575	.1675
White Seal	lb.	.1675	.1775
Horsehead XX-4, -78	lb.	.145	.155
Kadox-15, -17, -72, -515	lb.	.145	.155
-25	lb.	.1675	.1775
Lehigh, 35% leaded	lb.	.1513	.1613
50% leaded	lb.	.1538	.1638
Protox-166, -167	lb.	.145	.155
St. Joe, lead free	lb.	.145	.175
Zinc sulfide, comml	lb.	.253	.263
Cryptone ZS	lb.	.253	.263

Yellow

Cadmium yellow lithopones	lb.	1.12	1.15
Cadmolith	lb.	1.12	1.20
Cyanamid Hansa Yellow	lb.	2.20	
Du Pont	lb.	1.80	2.25
Filo	lb.	.10	
Iron oxide, comml	lb.	.0525	.1175
Lansco synthetic	lb.	.1075	
Mapico	lb.	.12	.1275
Williams	lb.	.115	.1225
Monsanto Yellow 14	lb.	1.91	
10010	lb.	1.91	
BYP-282	lb.	1.21	
GA	lb.	2.45	
S-10010	lb.	1.17	
Stan-Tone D-1100	lb.	2.55	
1101	lb.	.69	
Lemon 70 PCO1	lb.	1.77	2.19
D-7001	lb.	2.80	3.00
Medium yellow 70 PCO2	lb.	1.79	2.21
D-7002	lb.	2.98	3.18
Vansul masterbatch	lb.	.95	1.95
Williams Ocher	lb.	.0575	.06

Dusting Agents

Diatomaceous silica	ton	32.00	48.00
Extrud-o-Lube, conc	gal.	1.33	1.69
Glycerized Liquid Lubricant, concentrated	gal.	1.25	1.63

Latex-Lube GR	lb.	$0.20	
Pigmented	lb.	.1825	
R-66	lb.	.165	
Liqui-Lube	lb.	.1625	
N. T.	lb.	.1675	
Liquizinc No. 305	lb.	.30 /	$0.35
Lubrex	lb.	.25 /	.30
Mica 160 Biotite	lb.	.065 /	.0725
Mesh	lb.	.08 /	.0875
325 Mesh	lb.	.0825/	.09
Concord	lb.	.08 /	.09
Mineralite	ton	45 00	
Pyrax A	ton	14.50 /	15.00
W. A.	ton	17.00 /	17.50
Talc, comml.	ton	18 40 /	38 50
EM	ton	11.00 /	63.00
LS Silver	ton	29.25	
Nytals	ton	25 00 /	36.00
Sierra Sagger 7	ton	34 00	
White IR	ton	19 75	
III	ton	20.75	
Vanfre	gal.	2.00	

Extenders

BRS 700	lb.	.02 /	.0285
BRT 7	lb.	.03 /	.031
Cumar Resins	lb.	.065 /	.17
Dielex B	lb.	.06	
Factice, Amberex	lb.	.29 /	.36
Brown	lb.	.1425/	.263
Neophax	lb.	.157 /	.268
White	lb.	.144 /	.285
G. B. Asphaltenes	lb.	.097 /	.177
Millex. W	lb.	.07	
Mineral Rubbers			
Black Diamond	ton	38 00 /	40.00
Hard Hydrocarbon	ton	46.50 /	48 50
Hydrocarbon MR	ton	45 00 /	55 00
Parmr	ton	21 00 /	29.00
T-MR Granulated	ton	47.50 /	50.00
Nuba No. 1, 2	lb.	.0575/	.0625
3X	lb.	.0775/	.0825
OPD-101	lb.	.26	
Rubber substitute, brown	lb.	.16 /	.2572
Car-Bel-Ex A	lb.	.14	
Car-Bel-Lite	lb.	.35	
Extender 600	lb.	.1765	
White	lb.	.192 /	.2103
Stan-Shells	ton	35.00 /	73.00
Sublac Resin PX-5	lb.	.215 /	.235
Sundex 53	gal.	.12	
85	gal.	.1725	
Synthetic 100	lb.	.41	
Vistanex	lb.	.35 /	.475

Fillers, Inert

Agrashell flour	ton	50.00 /	74.00
Albacar	ton	55.00 /	75.00
Barytes, floated, white	ton	49.00 /	70.85
Off-color, domestic	ton	25.00	
No. 1	ton	55.00 /	77.50
2	ton	50.00 /	72.50
Sparmite	ton	95.00 /	117.00
Blanc fixe	ton	100.00 /	165.00
Burgess Iceberg	ton	50.00 /	80.00
Pigment #20	ton	35.00 /	60.00
#30	ton	37.00 /	60.00
HC-75	ton	12.00 /	30.00
-80	ton	14.00 /	32.00
WP #1	ton	11.00 /	16.00
Camel-Carb	ton	14.00	
-Tex	ton	22.00	
-Wite	ton	35.00	
Cary #200	ton	30.00 /	55.00
Citrus seed meal	lb.	.04	
Oil	lb.	.15	
Clays			
A. F. D. Filler	ton	29.50 /	36.00
Aiken	ton	14.00	
Albacar	ton	50 00 /	55.00
Aluminum Flake, coarse	ton	25.50 /	28.50
Fine	ton	29.50 /	36.00
#5	ton	27.50 /	34.50
Champion	ton	14.50	
Crown	ton	14.00 /	33.00
Dixie	ton	14.50	
Franklin	ton	13.50 /	35.25
GK Soft Clay	ton	11.00	
Harwick	ton	15 50 /	55.50
Hi-White R	ton	14.50 /	19.50
Hydratex R	ton	28 00	
Kaolloid	ton	10 50	
McNamee	ton	14.50	
RX-43	ton	33 00	
Natka 1200	ton	13.00	
Par	ton	13.00	
Paragon	ton	14.50 /	19.50
Recco	ton	14.00	
Sno-Brite	ton	12.50	
Stan-Clay	ton	28.00	
Stellar-R	ton	50.00	
Suprex	ton	14.50 /	19.50
Swanee	ton	12.50	
Windsor	ton	14.00 /	30.00
DC Silica	lb.	1.15 /	1.40
Diatomaceous silica	ton	32.00 /	48.00
Flocks			
Cotton, dark	lb.	.095 /	.135
Dyed	lb.	.55 /	.60
White	lb.	.13 /	.33
Fabrifil X-24-G	lb.	.135	
X-24-W	lb.	.235	
Filfloc 6000	lb.	.33	
F-40-900	lb.	.135	
HSC #35 Silicone Emulsion	lb.	1.22 /	2.46
Kalite	ton	52.50 /	67.50
Lithopone, comml.	lb.	$0.075 /	$0.085
Astrolith	lb.	.068 /	.0675
Eagle	lb.	.0725/	.075
Permolith	lb.	.08 /	.0875
Sunolith	lb.	075 /	.0825
Mica, 160 Biotite	lb.	.065 /	.0725
Mesh	lb.	.08 /	.0875
325 Mesh	lb.	.0825/	.09
Concord	lb.	.08 /	.09
Millical	ton	38.00 /	53.00
Mineralite	ton	40.00 /	60.00
Non-Fer-Al	ton	35.00 /	50.00
Ohio Superspray lime	ton	16.50	
Pulverized limestone, Stonelite	ton	8 25 /	11.00
Purecal	ton	56.75 /	71.75
Pyrax A	ton	13 50	
W. A.	ton	16.00	
Sawdust	ton	14.00 /	35.00
Silversheen Mica	lb.	.08 /	.09
StanWhite	ton	10.50 /	13.10
Super-White Silica	ton	25 00 /	46.50
Surfex	ton	37.50 /	52.50
MM	ton	42.00 /	57 00
Suspenso	ton	38.00 /	53.00
Ti-Cal	lb.	.0675	
Valron Estersil	lb.	2.00 /	2.25
Walnut shell flours	ton	50.00 /	84.00
Whiting, limestone			
Atomite	ton	32.50 /	35.00
Calcite	ton	23 00	
Calwhite	ton	20.00 /	27.00
-T	ton	23 00	
Duramite	ton	20.00	
Gamaco	ton	32 50 /	40.00
Keystone	ton	20.00 /	22.00
Laminar	ton	30.00	
No. 10 White	ton	11.00 /	16.50
Omya	ton	30.00	
BSH	ton	45.00	
Paxinosa	ton	14 50 /	22.50
Snowflake	ton	17.00 /	18.00
Witco	ton	13.00	
York	ton	9.50	

Finishes

Apex Bright Finish #5200-E	lb.	.25	
Rubber Finish	gal.	2.50	
Black-out	gal.	4.50 /	8.00
Flocks, Rayon, colored	lb.	.90 /	1.50
White	lb.	.75 /	1.25
Also see Flocks, under Fillers, Inert			
Paraflint RG and RGU Synthetic Wax	lb.	.15 /	.22
Rubber lacquer, clear	gal.	1.00 /	2.00
Shellacs, Angelo	lb.	.485 /	.7325
Vac Dry	lb.	.485 /	.57
Talc (*See Talc, under Dusting Agents*)			
Unidip	lb.	.15 /	.20
Wax, Bees	lb.	.68 /	.83
Carnauba	lb.	.57 /	1.13
Monten	lb.	.27	
No. 118, colors	gal.	.86 /	1.41
Neutral	gal.	.76 /	1.31
Van Wax	gal.	1.45 /	1.50

Latex Compounding Ingredients

Acintol D, DLR	lb.	.06 /	.075
FA #1	lb.	.065 /	.08
#2	lb.	.075 /	.09
Accelerator 552	lb.	2.25	
J-117, -302	lb.	1.00 /	1.15
-144	lb.	.15 /	.30
-307	lb.	1.10 /	1.25
-311	lb.	.60 /	.75
Aerosol, dry types	lb.	.39 /	1.20
Liquid types	lb.	.40 /	.72
Alcogum AA-16, MA-16	lb.	.20 /	.24
AK-12, PA-10	lb.	.12 /	.14
AN-6	lb.	.05 /	.075
-10	lb.	.085 /	.10
Alrosol	lb.	.41	
Amberex solutions	lb.	.1675/	.18
Antifoam J-114	lb.	3.25 /	3.45
P-242	lb.	.24 /	.35
Antioxidant J-137, -140	lb.	.55 /	.70
-139, -293	lb.	1.45 /	1.60
-182	lb.	2.00 /	2.15
-186	lb.	1.40 /	1.55
2246	lb.	1.50 /	1.53
Anti Webbing Agent J-183	lb.	.75 /	.90
-297	lb.	.27 /	.40
Aquablak B	lb.	.0975/	.1025
G	lb.	.12 /	.125
K	lb.	.12 /	.125
M	lb.	.105 /	.11
Aquarex D	lb.	.78	
G	lb.	.21	
L	lb.	.94	
MDL	lb.	.33	
ME	lb.	.80	
Aquarex NS	lb.	.60	
SMO	lb.	.50	
WAQ	lb.	.22	
Areskap 50	lb.	.30 /	.38
100, dry	lb.	.60 /	.72
Aresket 240	lb.	.30 /	.38
300, dry	lb.	.60 /	.72
Aresklene 375	lb.	.42 /	.57
Ben-A-Gels	lb.	.98 /	1.40
Bentone 18, 18C	lb.	.45	
34	lb.	.60	
Casein	lb.	.22	
Cellosize WP-09, -3, -40 -300	lb.	1.00 /	1.17
CW-12		.85	
-37	lb.	.70	
DC Antifoam A Compound	lb.	$5.45 /	$6.65
B	lb.	.68 /	1.20
Emulsion	lb.	2.05 /	4.00
AF Emulsion	lb.	2.05 /	2.85
Compound 7	lb.	5.13 /	6.50
Defoama W-1701	lb.	.125	
Defoamer 115a	lb.	.50	
NDW	lb.	.215 /	.235
Dispersing Agents			
Blancol	lb.	.1525/	.26
N	lb.	.155 /	.26
Darvan Nos. 1, 2, 3	lb.	.22 /	.30
Daxad 11, 21, 23, 27	lb.	.08 /	.30
Dispersaid H7A	lb.	.58	
1159	lb.	.43	
Emulphor ON-870	lb.	.50 /	.70
Igepal CO-630	lb.	.2875/	.47
Igepon T-73	lb.	.285 /	.495
T-77	lb.	.45 /	.69
Indulins	lb.	.06 /	.08
Kreelons	lb.	.132 /	.155
Laurelton Oil	lb.	.18	
Leonil SA	lb.	.52 /	.65
Lomar PW	lb.	.18	
Marasperse CB	lb.	.1225/	.1425
N	lb.	.095 /	.105
Modicols	lb.	.17 /	.58
Nekal BA-75	lb.	.395 /	.54
BX-76	lb.	.63 /	.75
Nopco 1287	lb.	.155 /	.195
Orzan A	lb.	.0325	
S	lb.	.0425	
Pluronics	lb.	.335 /	.40
Polyfons	lb.	.08 /	.09
Sorapon SF-78	lb.	.28 /	.40
Tergitol NPX	lb.	.275 /	.3074
TMN	lb.	.2875/	.32
7	lb.	.4125/	.44
Trenamine W-30	lb.	.15	
W-40	lb.	.60 /	.75
Triton R-100	lb.	.12 /	.25
X-100, -102, -114	lb.	.255 /	.36
Dispersions			
Agebest 1293-22	lb.	1.90 /	2.00
AgeRite Alba	lb.	3.00	
Powder, Resin D	lb.	.80	
White	lb.	1.80	
Altax	lb.	.75	
Shield Nos. 2, 6	lb.	.08	
3	lb.	.095	
4-35	lb.	.09	
5	lb.	.093	
7-F, 8	lb.	.165	
55	lb.	.18	
Iron Oxide. 60%	lb.	.40	
L.S.W.	lb.	1.50	
No. 305 Liquizinc	lb.	.30 /	.35
P-33	lb.	.35	
Rotax	lb.	.75	
Sulfur	lb.	.12 /	.30
No. 2	lb.	.14 /	.16
Telloy	lb.	3.00	
Tuads, Methyl	lb.	1.14	
Vulcacure NB	lb.	.45	
NS	lb.	.75 /	1.05
ZB, ZE, ZM	lb.	.85 /	.89
Vulcanizing, C group	lb.	.40 /	1.30
G group	lb.	.45 /	.90
N group	lb.	.40 /	1.00
Vulcafoams	lb.	.40 /	.70
Vulcanols	lb.	.75 /	.80
Zetax	lb.	.75	
Zimates, Butyl	lb.	1.04	
Ethyl, Methyl	lb.	1.04	
Zinc oxide	lb.	.40	
Emulsions			
AgeRite Stalite	lb.	.75	
Borden Arcco A-25, A-26, 716-30	lb.	.18 /	.19
555-40-R	lb.	.185 /	.205
620-32B	lb.	.20 /	.21
716-35	lb.	.17 /	.18
1041-21	lb.	.165 /	.175
Habuco Resin Nos. 502, 515, 523	lb.	.195 /	.20
503	lb.	.22 /	.225
504, 526	lb.	.19 /	.195
517	lb.	.175 /	.18
524	lb.	.155 /	.16
Resin A-2	lb.	.16 /	.25
P-370	lb.	.175 /	.25
X-210	lb.	.12 /	.22
Freeze-Stabilizer 322	lb.	.40	
12116C	lb.	.52	
Hyonic PE 250	lb.	.255 /	.295
Igepon T-43	lb.	.145 /	.35
T-51	lb.	.125 /	.285
-73	lb.	.285 /	.495
Ludox	lb.	.1675/	.195
Marmix	lb.	.41 /	.48
Merac	lb.	.75 /	1.05
Micronex, colloidal	lb.	.06 /	.072
Modical S	lb.	.3084/	.3284
VD	lb.	.1384/	.1584
Monsanto Blue 4685 WD	lb.	1.60	
Green 4884 WD	lb.	1.80	
Red 127	lb.	1.25	
OPD 101	lb.	.16 /	.26
Picco Latex Plasticizer A-12	lb.	.069 /	.096
Pliolite Latex 150, 190	lb.	.32 /	.41
170	lb.	.37 /	.46
Polyvinyl methyl ether	lb.	.25 /	.45
Resin V	lb.	.13	
Roelgel 100C	lb.	.46	
Santomerse D	lb.	.44 /	.65
S	lb.	.13 /	.25
Sellogen Gel	lb.	.1275	
Sequestrene AA	lb.	.905 /	.975
30A	lb.	.245 /	.265
ST	lb.	.585 /	.615

Setsit #5	lb.	$0.75	$1.05
D #9	lb.	.85	1.15
Stablex A	lb.	.80	1.10
B, G	lb.	.50	.95
K	lb.	.27	.35
P	lb.	.35	.50
T	lb.	.14	.22
Surfactol 13	lb.	.345	.36
Webnix	lb.	1.50	2.50

Mold Lubricants

Acintol D	lb.	.06	.75
A-C Polyethylene	lb.	.30	.47
Alipal CO-433	lb.	.25	.45
CO-436	lb.	.22	.41
Aquarex Compounds	lb.	.21	.94
Carbowax 200, 300, 400	lb.	.22	.25
1500	lb.	.255	.2825
4000	lb.	.31	.32
6000	lb.	.35	.36
Castorwax	lb.	.3375	.3575
Colite Concentrate	gal.	.90	1.15
D-Tak Dip #10	gal.	1.50	
DC Mold Release Fluid	lb.	3.14	4.75
Compound 4, 7	lb.	5.13	6.50
Emulsion 7	lb.	1.20	1.74
8, 35, 35A, 35B, 36	lb.	1.20	1.74
200 Fluid	lb.	3.14	4.75
ELA	lb.	.82	
FT Wax 200	lb.	.265	.42
300	lb.	.295	.45
Glycerized Liquid Lubricant, concentrated	gal.	1.25	1.63
Igepals	lb.	.2875	.74
Igepon AP-78	lb.	.44	.68
T-43	lb.	.145	.35
-51	lb.	.125	.285
-73	lb.	.285	.495
Lubrex	lb.	.27	.32
Lubri-Flo	gal.	10.00	12.05
Lustermold	lb.	.41	
L-41 Diethyl Silicone Oil	lb.	3.50	
Mold Paste	lb.	.25	
Monopole Oil	lb.	.16	
Monten Wax	lb.	.57	
Para Lube	lb.	.046	.048
Paraflint RG and RGU Synthetic Wax	lb.	.15	.22
Plaskon 8406, 8407	lb.	.30	.37
8416, 8417	lb.	.35	.42
8429	lb.	.40	.47
Pluronics	lb.	.335	.44
Poly-Brite PE-200	lb.	.28	.42
600	lb.	.42	.58
Poly-Cone 125X	lb.	1.20	1.40
1000	lb.	.93	1.06
Polyglycol E series	lb.	.29	.42
RA-1, -2, -3	gal.	2.25	3.00
Rubber Glo	gal.	.94	.97
SM-33, -55, -61, -62	lb.	1.22	1.76
Soap, Hawkeye	lb.	1.35	1.45
Purity	lb.	.155	.165
Sodium stearate	lb.	.40	
Stoner's 700 series	gal.	1.20	1.25
800 series	gal.	1.26	1.70
900 series	gal.	1.55	2.55
A Series	gal.	1.80	4.50
Ucon 50-HB Series	lb.	.25	.375
Ulco	lb.	.12	.23
Vanfre	gal.	1.95	3.00

Odorants

Alamasks	lb.	.75	6.50
Coumarin	lb.	2.95	3.55
Curodex 19	lb.	4.75	5.05
188	lb.	5.75	
198	lb.	5.75	
Ethavan	lb.	6.75	7.35
Latex Perfume #7	lb.	4.00	
Neutroleum Gamma	lb.	3.60	
Rodo	lb.	4.00	5.50
Rubber Perfume #10	lb.	2.60	
Vanillin, Monsanto	lb.	3.00	3.15

Plasticizers and Softeners

Acintol R	lb.	.065	.07
Adipol 2EH, 10A, XX	lb.	.40	.435
BCA	lb.	.43	.455
ODY	lb.	.43	.465
Admex 710	lb.	.325	
711	lb.	.345	
744	lb.	.40	
Aro Lene #1980	lb.	.10	.12
Baker AA Oil	lb.	.195	.24
Crystal O Oil	lb.	.21	.255
Processed oils	lb.	.215	.235
Bardol, 639	lb.	.215	.235
B	lb.	.0625	.065
Benzoflex 2-45	lb.	.26	.29
9-88	lb.	.27	.30
Bondogen	lb.	.555	.605
BRC 20	lb.	.15	.175
22	lb.	.025	.0275
30	lb.	.0125	.021
521	lb.	.019	.02
BRH 2	lb.	.0213	.0351
BRS 700	lb.	.02	.0285
BRT 7	lb.	.03	.031
BRV	lb.	.0475	.0565
Bunarex Liquid	lb.	.0425	.0555
Resins	lb.	.065	.1225
Bunnatol G, S	lb.	.40	.505
Butac	lb.	.125	.135
Butyl stearate, comml	lb.	.255	
Harchem	lb.	.2525	.3425
Binney & Smith	lb.	.23	.26
Ohio-Apex	lb.	.245	.255
Butyl stearate—G. P.	lb.	$0.0125	$0.02
R-100	lb.	.045	.0525
TT	lb.	.017	.02
Califlux G. P.	lb.	.015	.0225
R-100	lb.	.0475	.0575
T-T	lb.	.019	.0295
510, 550	lb.	.0275	.0375
Capryl alcohol, comml	lb.	.195	.235
Columbian Carbon	lb.	.195	.30
Harchem	lb.	.195	.30
Chlorowax 40	lb.	.1625	.1825
70	lb.	.185	.245
-S	lb.	.21	.27
Circo light	gal.	.17	
Circosol-2XH	gal.	.185	
Contogums	lb.	.0875	.111
Cumar Resins	lb.	.065	.17
DBM (dibutyl-m-cresol) Darax	lb.	.32	.3475
DBP (dibutyl phthalate), comml	lb.	.30	.133
Darex	lb.	.30	.33
Eastman	lb.	.29	.335
Harflex 140	lb.	.30	.395
Harwick Std. Chem. Co.	lb.	.325	.385
Hatco	lb.	.30	.33
Monsanto	lb.	.30	.335
Naugatuck	lb.	.30	.33
Ohio-Apex	lb.	.30	.335
PX-104	lb.	.30	.33
Rubber Corp. of America	lb.	.30	.44
Sherwin-Williams	lb.	.30	.33
DBS (dibutylsebacate) comml	lb.	.66	.69
Eastman	lb.	.68	.71
Harflex 40	lb.	.655	.745
Hatco	lb.	.66	.685
Monoplex	lb.	.66	.675
Naugatuck	lb.	.665	.69
PX-404	lb.	.665	.69
DCP (dicaprylphthalate), comml	lb.	.295	.325
Harflex 180	lb.	.27	.36
Hatco	lb.	.295	.325
Monoplex	lb.	.30	.315
DDA (didecyladipate) Good-rite GP-236	lb.	.40	.55
DDP (didecylphthalate) Good-rite GP-266	lb.	.295	.45
Hatco	lb.	.305	.435
Defoamer X-3	lb.	.355	
DIBA (diisobutyladipate) Darex	lb.	.4325	.4625
Eastman	lb.	.41	.44
Ohio-Apex	lb.	.41	.445
DIDA (diisodecyladipate) Monsanto	lb.	.40	.435
RC	lb.	.40	.54
DIDP (diisodecylphthalate) Darex	lb.	.32	.35
Harchem	lb.	.29	.385
Monsanto	lb.	.29	.325
Ohio-Apex	lb.	.29	.325
PX-120	lb.	.305	.335
RC	lb.	.29	.43
Dielex B	lb.	.06	
Diethylene glycol, comml	lb.	.1525	.1825
Wyandotte	lb.	.15	.165
Dinopol IDO	lb.	.285	.32
DIOA (diisooctyladipate) Harflex 220	lb.	.40	.495
Naugatuck	lb.	.435	.465
PX-208	lb.	.425	.455
Rubber Corp. of America	lb.	.40	.54
DIOP (diisooctylphthalate), comml	lb.	.305	.335
Darex	lb.	.32	.35
Eastman	lb.	.305	.335
Harflex 120	lb.	.28	.375
Hatco	lb.	.305	.335
Monsanto	lb.	.28	.315
Naugatuck	lb.	.305	.335
Ohio-Apex	lb.	.28	.315
PX-108	lb.	.305	.335
Rubber Corp. of America	lb.	.28	.43
Sherwin-Williams	lb.	.32	.34
DIOS (diisooctylsebacate), comml	lb.	.61	.64
Rubber Corp. of America	lb.	.5925	.70
DIOZ (diisooctylazelate) Cabflex	lb.	.48	.51
Dipolymer Oil	gal.	.33	.38
Dispersing Oil No. 10	lb.	.06	.0625
DNODA (di-n-octyl-n-decyl adipate), Monsanto	lb.	.40	.435
DOA (dioctyladipate), comml	lb.	.425	.455
Eastman	lb.	.40	.43
Good-rite GP-233	lb.	.40	.55
Harflex 250	lb.	.40	.495
Hatco	lb.	.435	.465
Monsanto	lb.	.40	.435
Naugatuck	lb.	.435	.465
PX-238	lb.	.425	.455
Rubber Corp. of America	lb.	.40	.54
DOP (dioctylphthalate), comml	lb.	.305	.335
Darex	lb.	.32	.35
Eastman	lb.	.28	.315
Good-rite GP-261	lb.	.285	.44
Harflex 150	lb.	.28	.375
Hatco	lb.	.305	.335
Monsanto	lb.	.28	.315
Naugatuck	lb.	.305	.335
Ohio-Apex	lb.	.28	.315
Polycizer 162	lb.	.28	.435
PX-138	lb.	.305	.335
Rubber Corp. of America	lb.	.28	.43
Sherwin-Williams	lb.	.305	.335
DOS (dioctylsebacate), comml	lb.	$0.61	$0.64
Eastman	lb.	.61	.64
Harflex 50	lb.	.5925	.6825
Hatco	lb.	.61	.635
Monoplex	lb.	.61	.635
Naugatuck	lb.	.615	.64
PX-438	lb.	.615	.64
Rubber Corp. of America	lb.	.5925	.70
Drapex 3.2	lb.	.40	.54
Dutch Boy NL-A10 (DBP)	lb.	.30	.33
-A20 (DOP), A30 (DIOP)	lb.	.305	.335
-A54	lb.	.295	.325
-C20 (DOS)	lb.	.61	.63
-F21	lb.	.395	.425
-F31	lb.	.44	.47
-F41	lb.	.48	.51
Dutrex 6	lb.	.025	.035
Dymerex Resin	lb.	.135	.1475
Emulphor EL-719	lb.	.52	.73
Endor	lb.	.65	
Ethox	lb.	.43	.455
Ethylene glycol, comml	lb.	.135	.165
Wyandotte	lb.	.1325	.1425
Flexol 3 GH	lb.	.44	.46
3 GO	lb.	.53	.55
4 GO	lb.	.325	.355
10-A	lb.	.425	.455
426	lb.	.27	.30
810, 810X, 10-10, 10-10X	lb.	.305	.335
TOF, A-26	lb.	.435	.465
Flexricin P-4	lb.	.3475	.3625
P-6	lb.	.415	.43
P-8	lb.	.3475	.3625
PG-16	lb.	.335	.35
Fortex	lb.	.125	.145
G. B. Asphaltic Flux	gal.	.097	.177
Naphthenic Neutrals	gal.	.125	.215
Process oil, light	lb.	.0275	.0375
Medium	lb.	.0375	.0475
Galex W-100	lb.	.155	.18
W-100 D	lb.	.1525	.1775
Gilsowax B	lb.	.0975	.11
Harchemex	lb.	.24	.345
Harflex 300	lb.	.58	.675
325	lb.	.4325	.52
375	lb.	.7425	.83
500	lb.	.315	.41
HB-20	lb.	.15	.17
-40	lb.	.19	.22
Heavy Resin Oil	lb.	.0225	.0375
HSC-13	lb.	.25	.32
-39	lb.	.22	.29
Hycar 1312	lb.	.60	
Indonex	gal.	.13	.225
Kapsol	lb.	.33	.355
Kenflex A, L	lb.	.26	.27
B	lb.	.23	.24
N	lb.	.18	.19
Kessoflex 103	lb.	.405	
105	lb.	.3325	
106	lb.	.38	
107	lb.	.525	
110	lb.	.24	
111	lb.	.28	
KP-23	lb.	.315	.325
-90	lb.	.40	.435
-140	lb.	.46	.485
-201	lb.	.58	.59
-220	lb.	.33	.365
-555	lb.	.59	.60
Kronisol	lb.	.33	.365
Kronitex AA, I, K-3, Mx	lb.	.325	.36
LX-685, -125, -135	lb.	.125	.135
Marvinol plasticizers	lb.	.28	.8825
Methox	lb.	.385	.41
Monoplex S-38	lb.	.215	.24
S-71	lb.	.45	.475
Morflex	lb.	.25	.65
Natac	lb.	.12	.13
Neoprene Peptizer P-12	lb.	1.05	
Nevillac	lb.	.31	.85
Neville R Resins	lb.	.145	.205
Nevinol	lb.	.24	
No. 1-D heavy oil	lb.	.065	
NP-10	lb.	.50	.53
ODA (octyldecyladipate) Good-rite GP-235	lb.	.40	.55
RC	lb.	.40	.54
ODP (octyldecylphthalate) Good-rite GP-265	lb.	.29	.445
Hatco	lb.	.305	.335
Rubber Corp. of America	lb.	.285	.43
Ohopex Q-10	lb.	.28	.315
R-9	lb.	.3525	.3775
Orthonitro benzophenol, comml	lb.	.13	.15
Palmalene	lb.	.15	
Panaflex BN-1	lb.	.185	.225
Panarez Resins	lb.	.09	.14
Para Flux, regular	gal.	.10	.2125
No. 2016	gal.	.165	.24
2332	gal.	.11	
4205	lb.	.1075	.2125
Para Lube	lb.	.046	.048
Resins	lb.	.04	.045
Paradene Resins	lb.	.07	.08
Paraplex 5-B	lb.	.29	.3475
Al-111	lb.	.32	.3275
G-25	lb.	.76	.77
-40	lb.	.4825	.51
-50	lb.	.39	.4175
-53	lb.	.4325	.46
-60	lb.	.325	.35
-62	lb.	.345	.37
RG-7	lb.	.33	.335
-8	lb.	.505	.5125
-10	lb.	.52	.5275
Peptizer 620	lb.	.37	

Peptizer 640	lb.	$0.42	
Pepton 22	lb.	0.83 /	$0.86
65	lb.	1.23 /	1.26
65-B	lb.	.83 /	.86
Philrich 5	gal.	.11	
Picco Resins	lb.	.1275/	.22
480 Oilproof Series	lb.	.18 /	.23
Aromatic Plasticizers	lb.	.05 /	.065
Liquid Resin D-165 (Y)	lb.	.06 /	.075
(Z-3)	lb.	.07 /	.085
(Z-6)	lb.	.08 /	.095
S. O. S.	gal.	.29 /	.34
Piccocizers	lb.	.04 /	.055
Piccolastic Resins	lb.	.16 /	.25
Piccolyte Resins	lb.	.205 /	.245
Piccopale Resins	lb.	.12 /	.135
Piccovars	lb.	.165 /	.20
Piccovol	lb.	.025 /	.038
Pictar	gal.	.25 /	.30
Pigmentar	lb.	.046 /	.0634
Pigmentaroil	lb.	.046 /	.0634
Pitch, Burgundy, Sunny South	lb.	.1030/	.1085
Plasticizers			
42	lb.	.34 /	.40
84	lb.	.27 /	.305
B	lb.	.35 /	.45
DP-520	lb.	.435 /	.455
MP	lb.	.035 /	.0755
MT-511	lb.	.6925/	.7425
ODN	lb.	.35 /	.475
SC	lb.	.40 /	.515
Plastoflex #3	lb.	.52 /	.57
#520	lb.	.36 /	.435
DBE	lb.	.50 /	.55
MGB	lb.	.29 /	.37
SP-2	lb.	.43 /	.48
VS	lb.	.3575/	.3975
Plastogen	lb.	.0875/	.09
Plastone	lb.	.25 /	.32
Polycin 470	lb.	.325 /	.34
Polycizers	lb.	.28 /	.55
162	lb.	.285 /	.44
Polymel-C	lb.	.1775/	.1875
D	lb.	.225 /	.235
D-TAC	lb.	.1975/	.215
DX, C-130	lb.	.1375/	.1475
Poly-Sperse AP-2	lb.	.23 /	.295
AP-300	lb.	.26 /	.325
LC-20	lb.	.26 /	.325
R-100	lb.	.17 /	.325
PT Pine Tars	lb.	.038 /	.0554
Reogen	lb.	.1425/	.145
101 Pine Tar Oil	lb.	.038 /	.0554
Resin C pitch	lb.	.0225/	.031
R6-3	lb.	.38 /	.40
Resinex 10, 25, 50, 110	lb.	.04 /	.045
70	lb.	.0325/	.0375
85, 100	lb.	.035 /	.04
115	lb.	.0375/	.0425
L-2, L-3, L-4, L-5	lb.	.0225/	.03
Rosin Oil, Sunny South	gal.	.58 /	.76
RPA No. 2	lb.	.82	
3	lb.	.48	
Conc.	lb.	.85	
5	lb.	.68	
6	lb.	1.62	
RSN Flux	gal.	.10 /	.91
Rubber Oil B-5	lb.	.0225/	.0355
Rubberol	lb.	.18 /	.2725
Santicizer 1-H	lb.	.50 /	.52
8	lb.	.44 /	.46
9	lb.	.42 /	.44
140	lb.	.325 /	.36
141	lb.	.34 /	.375
160	lb.	.265 /	.30
602	lb.	.285	
B-16	lb.	.4875/	.4975
E-15	lb.	.52 /	.55
Santocizer	lb.	.4275/	.4575
Sebacic acid, purified, comml.	lb.	.59 /	.65
Binney & Smith	lb.	.64 /	.76
C. P.- Binney & Smith	lb.	.72 /	.84
Harchem	lb.	.69 /	.89
Sherolatum Petroleum	lb.	.05 /	.10
Softener #20	gal.	.10 /	.20
Special Rubber Resin 100	lb.	.1675/	.2175
Staflex AX	lb.	.43	
DBES	lb.	.61 /	.635
Syn-Tac	gal.	.33 /	.35
Synthol	lb.	.17 /	.2625
Thiokol TP-90B	lb.	.59	
-95	lb.	.65	
Triacetin	lb.	.365 /	.40
Tributyl phosphate	lb.	.50 /	.535
Tributyrin	lb.	.69	
Tricresyl phosphate, comml	lb.	.33 /	.36
Monsanto	lb.	.325 /	.36
Naugatuck	lb.	.33 /	.36
PX-917	lb.	.33 /	.36
Triphenyl phosphate, comml	lb.	.39 /	.40
Monsanto	lb.	.39 /	.40
Turgum S	lb.	.1075/	.1175
SB	lb.	.0675/	.0775
Tysonite	lb.	.3025/	.305
United	gal.	.69 /	1.20
X-1 Resinous Oil	lb.	.0225/	.0325

Reclaiming Oils

Acintol C, P	lb.	.02 /	.03
Bardol, 639	lb.	.0275/	.0375
B	lb.	.0625/	.065
BRH 2	lb.	.0213/	.0351
BRT 3	lb.	.018 /	.0265
4	lb.	.025 /	.026
7	lb.	.03 /	.031
BRV	lb.	.0475/	.0565
Burco-RA	lb.	$0.053 /	$0.0805
BWH-1	lb.	.16 /	.18
Dipolymer Oil	gal.	.33 /	.43
Dispersing Oil No. 10	lb.	.06 /	.0625
G. B. Oils	gal.	.115 /	.275
Heavy Resin Oil	lb.	.0225/	.0375
LX-572	gal.	.27 /	.32
-759	gal.	.1375	
-777, -809, -859	gal.	.23 /	.33
-869	gal.	.33 /	.43
-871	gal.	.34 /	.44
No. 3186	gal.	.28 /	.295
Picco 6535	gal.	.25 /	.30
C-33	gal.	.215 /	.315
-42	gal.	.23 /	.33
D-4	gal.	.27 /	.37
E-5	gal.	.25 /	.35
Q-Oil	gal.	.286 /	.36
PT 101 Pine Tar Oil	lb.	.038 /	.0554
Reclaiming Oil #3186	gal.	.28 /	.385
-G	gal.	.25 /	.365
4039-M	gal.	.3275/	.3975
-Y	gal.	.30 /	.37
RR-10	lb.	.37	
S. R. O.	lb.	.015 /	.0225
X-1 Resinous Oil	lb.	.0225/	.0325

Reinforcers, Other Than Carbon Black

Angelo Shellacs	lb.	.485 /	.7325
Borden, Chem. Div.			
Arcco 978-42B	lb.	.18 /	.19
1073-18B	lb.	.135 /	.145
1294-36B	lb.	.115 /	.125
1301-12B	lb.	.15 /	.16
BRC 20	lb.	.15 /	.175
22	lb.	.025 /	.0275
30	lb.	.0125/	.021
521	lb.	.019 /	.02
Bunarex Resins	lb.	.065 /	.1225
Cab-o-sil	lb.	.67 /	.85
Calcene CO	ton	105.00	
NC	ton	80.00 /	100.00
TM	ton	82.50 /	102.50
Calco S. A.	lb.	.85 /	.88
Clays			
Aiken	ton	14.00	
Aluminum Flake	ton	22.25 /	60.00
Buca	ton	45.00	
Burgess Iceberg	ton	50.00 /	80.00
Icecap K	ton	65.00 /	90.00
Pigment #20	ton	35.00 /	60.00
#30	ton	37.00 /	60.00
Catalpo	ton	35.00	
Crown	ton	14.00 /	33.00
Dixie	ton	14.50	
Franklin	ton	13.50 /	35.25
L. G. B.	ton	17.50	
McNamee	ton	14.50	
Par	ton	15.00	
Paragon	ton	14.50 /	33.00
Pigment No. 33	ton	37.00	
Polyfil C	ton	25.00	
Recco	ton	14.00	
Suprex	ton	14.50 /	33.50
Swanee	ton	12.50	
Whitetex	ton	50.00	
Windsor	ton	14.00 /	30.00
Witco No. 1	ton	14.00 /	30.00
No. 2	ton	13.50 /	30.00
Clearcarb	lb.	.1175/	.1255
Cumar Resins	lb.	.065 /	.17
Darex Resins	lb.	.42 /	.49
DC Silica	lb.	1.15 /	1.40
Diatomaceous silica	ton	32.00 /	48.00
Good-rite 2007		.36 /	.38
2057		.30 /	.31
K Series Polymers	lb.	.15 /	.37
233	lb.	.08 /	.095
X303	lb.	.40 /	.45
Hi-Sil 233	lb.	.08 /	.095
X303	lb.	.40 /	.45
Hycar 2001	lb.	.55	
2007	lb.	.39	
Indulins	lb.	.06 /	.08
Kralac A-EP	lb.	.43 /	.54
Laminar	ton	30.00	
Magnesium carbonate, Marinco CL	lb.	.105 /	.135
Marbon Resins	lb.	.36 /	.43
Multifex MM	ton	117.50 /	137.50
Super	ton	167.50 /	187.50
Neville Resins			
465	lb.	.075 /	.08
LX-509	lb.	.33 /	.35
Nebony	lb.	.045 /	.05
Paradene	lb.	.07 /	.08
R	lb.	.145 /	.205
Para Resins 2457	lb.	.04 /	.045
Parapol S-Polymers	lb.	.44	
Picco Resins	lb.	.1275/	.22
Piccolyte Resins	lb.	.205 /	.275
Piccoumaron Resins	lb.	.07 /	.19
Piccovars	lb.	.145 /	.20
Pliolite NR types	lb.	.98 /	1.33
S-3	lb.	.42 /	.49
S-6	lb.	.36 /	.43
-6B	lb.	.36 /	.43
E	lb.	.36 /	.43
Plio-Tuf G85C	lb.	.52 /	.59
Purecal M	ton	56.75 /	71.75
SC, T	ton	110.00 /	125.00
U	ton	120.00 /	135.00
R-B-H 510	lb.	.15 /	.22
Resinex	lb.	.0375/	.0525
Rubber Resin LM-4	lb.	.28 /	.35
Silene EF	ton	110.00 /	130.00
L	lb.	.0575/	.0675
Silvacons	ton	55.00 /	85.00
Transphalt	lb.	.0375/	.0525
Witcarb P	ton	$117.50 /	$153.50
R	ton	127.50 /	163.50
Regular	ton	60.00 /	96.00
Zeolex 23	lb.	.055 /	.06
Zinc oxide, commercial†	lb.	.135 /	.1775

Retarders

Benzoic acid TBAO-2	lb.	.44	
E-S-E-N	lb.	.37 /	.39
Good-rite Vultrol	lb.	.62 /	.66
R-17 Resin	lb.	.1075/	.36
Retarder ASA	lb.	.57	
J	lb.	.68 /	.73
PD	lb.	.39 /	.41
W	lb.	.42	
Retardex	lb.	.47 /	.50
Thionex	lb.	1.14	
Wiltrol P	lb.	.39 /	.41

Solvents

Bondogen	lb.	.555 /	.605
Butyrolactone	lb.	.60 /	.65
Cosol #1	gal.	.37 /	.43
#2	gal.	.42 /	.48
Dichloro Pentanes	lb.	.04 /	.07
Dipentene DD, Sunny South	gal.	.42 /	.63
Ethylene dichloride, comml.	lb.	.09 /	.122
Hi-Flash 2-50-W	gal.	.41	
Pale yellow	gal.	.39	
LX-572	gal.	.27 /	.32
-748	gal.	.16 /	.23
Methyl-2-pyrrolidone	lb.	.75 /	.80
Neville Nos. 100, 104	gal.	.52 /	.60
106	gal.	.38 /	.46
Nevsolv H, 200	gal.	.19 /	.29
HF, T, 30	gal.	.24 /	.34
Penetrell	gal.	.42 /	.63
Picco Hi-Solv Solvents	gal.	.16 /	.48
Pine Oil DD, Sunny South	lb.	.15	
Skellysolve-B	gal.	.17	
-H	gal.	.148	
-R, -V	gal.	.139	
-C	gal.	.162	
Stauffer Carbon Disulfide	lb.	.0525/	.085
Tetrachloride	lb.	.0825/	.475

Tackifiers

Acintol R	lb.	.065 /	.07
Bardol, 639	lb.	.0275/	.0375
Borden, Arcco			
A25, A26, 716-30	lb.	.18 /	.19
555-40R	lb.	.185 /	.205
620-32B	lb.	.20 /	.21
716-35	lb.	.17 /	.18
1041-21	lb.	.165 /	.175
BRH 2	lb.	.0213/	.0351
Bunarex Resins	lb.	.065 /	.1225
Chlorowax 70	lb.	.18 /	.24
Contogums	lb.	.0875/	.11
Cumar Resins	lb.	.065 /	.17
Galex W 100	lb.	.155 /	.17
W-100D	lb.	.1525/	.1625
Indopol H-35	gal.	.65 /	.84
H-50	gal.	.70 /	.89
-100	gal.	.85 /	1.08
-300	gal.	1.00 /	1.24
-1500	gal.	1.48	
L-10	gal.	.40 /	.59
-50	gal.	.45 /	.64
-100	gal.	.55 /	.74
Kenflex resins	lb.	.18 /	.27
Koresin	lb.	.90 /	1.10
Natac	lb.	.12 /	.13
Nevindene	lb.	.15 /	.18
Picco Resins	lb.	.1275/	.22
Piccolastic Resins	lb.	.1855/	.34
Piccolyte Resins	lb.	.185 /	.25
Piccopale Resins	lb.	.089 /	.13
Piccoumaron Resins	lb.	.07 /	.185
R-B-H 510	lb.	.15 /	.22
Roelflex 1118A	lb.	.39	
Synthetic 100	lb.	.41	
Synthol	lb.	.17 /	.2625
United	gal.	.69 /	1.20

Vulcanizing Agents

Dibenzo G-M-F	lb.	2.60	
G-M-F #113, #117	lb.	.90	
Dodecenyl succinic anhydride	lb.	.75 /	.76
HMDA-Carbamate	lb.	4.50 /	4.90
Ko-Blend I. S.	lb.	.39	
Litharge (*See Accelerator-Activators, Inorganic*)			
Magnesium oxide	lb.	.2525/	.38
Maglite D, K	lb.	.235 /	.305
M	lb.	.2675/	.33
Marmag	lb.	.2225/	.2725
PSD 85	lb.	.37 /	.50
Red Lead (*See Accelerator-Activators, Inorganic*)			
Sulfasan R	lb.	1.55 /	1.57
Sulfur flour, comml.	100 lbs.	2.55 /	3.30
1018	lb.	.12 /	.1575
Aero	100 lbs.	2.40 /	7.75
Crystex	lb.	.195 /	.23
Insoluble 60	lb.	.125 /	.13
Rubbermakers	100 lbs.	2.65 /	4.55
Stauffer	lb.	.0265/	.054
Telloy	lb.	2.75	
VA-7	lb.	.50 /	.60
Vandex	lb.	7.50	
Vultac No. 2	lb.	.47 /	.74
3	lb.	.51 /	.78
White lead silicate (*See Accelerator-Activators, Inorganic*)			

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All Classified Advertising Must Be Paid in Advance

(No agency commission allowed except on display units)

GENERAL RATES	Light face type $1.25 per line (ten words) Bold face type $1.60 per line (eight words)
SITUATIONS WANTED RATES	Light face type 40c per line (ten words) Bold face type 55c per line (eight words)
SITUATIONS OPEN RATES	Light face type $1.00 per line (ten words) Bold face type $1.40 per line (eight words)

Allow nine words for keyed address.

Letter replies forwarded without charge, but no packages or samples.

ADDRESS ALL REPLIES TO NEW YORK OFFICE AT 386 FOURTH AVENUE, NEW YORK 16, N. Y.

SITUATIONS OPEN

WANTED: MANUFACTURER'S REPRESENTATIVE TO SELL our line of high-quality molded long fiber asbestos-rubber gaskets both for original equipment and replacement sales.

Need aggressive individual in Chicago, Ill., Philadelphia, Pa., Cleveland, Ohio, St. Louis, Mo., Los Angeles, Calif., Pittsburgh, Pa., Boston, Mass., New York City, or Metropolitan Newark, N. J. Address Box No. 2233, care of RUBBER WORLD.

WANTED: POSITION AVAILABLE WITH LARGE EASTERN rubber manufacturer for chemist experienced in compounding and production control work. Will take charge of tread rubber (camelback) and repair material development and service. Liberal company-paid employe benefits in addition to salary. Address Box No. 2234, care of RUBBER WORLD.

ASPHALT AND
VINYL ASBESTOS

Engineer thoroughly experienced in manufacture of asphalt and vinyl asbestos tile. Excellent opportunity with outstanding flooring manufacturer. Write full details of background, experience and salary required. Our employes know of this ad. Replies kept strictly confidential. Address Box No. 2239, care of RUBBER WORLD.

RUBBER CHEMISTS — COMPOUNDER

Positions Open: (1) Assistant Chief Chemist
(2) Specification Rubber Goods Chemist
(3) Blown Closed-Cell Chemist

Heel and sole experience desirable, but not essential. Salary dependent on experience. No age limit. Our employes know of this advertisement. Address Box No. 2237, care of RUBBER WORLD.

WANTED: TECHNICAL SALESMAN TO RUBBER INDUSTRY west coast—30-40 years of age. Actual compounding and sales experience in area preferred. Forward professional résumé. Write H. M. Royal (Personal), c/o H. M. ROYAL, INCORPORATED, 689 Pennington Avenue, Trenton, New Jersey.

TECHNICAL SALES REPRESENTATIVE—WELL-ESTABLISHED chemical organization serving the rubber industry offers fine opportunity for graduate chemist or chemical engineer with rubber compounding experience. Midwest territory. Forward full résumé to Box No. 2240, care of RUBBER WORLD.

CHEMIST

Rubber Chemist, experienced in coated fabrics field, to take charge of formulating compounds and testing finished products. ARCHER RUBBER COMPANY, Milford, Massachusetts.

SITUATIONS WANTED

SALES, TECHNICAL SERVICE, APPLICATIONS, OR SIMILAR position in rubber and/or plastics. Compounder fourteen years' diversified experience in production, development, and technical service. East Coast preferred. Address Box No. 2236, care of RUBBER WORLD.

CHEMICAL CONSULTANT has increased facilities for the development of latex and emulsion coatings, paints and adhesives. We also prepare brochures with "starting formulas" for raw material manufacturers and assist manufacturers with production problems. Live in the Midwest, but do travel. Address Box No. 2238, care of RUBBER WORLD.

SITUATIONS WANTED (Cont'd)

CHEMICAL ENGINEER, LONG RUBBER EXPERIENCE IN overall operations. Theoretical and practical knowledge of closed-cell sponge manufacturing process from compounding to a final odorless product. Will accept a responsible domestic or foreign assignment. Address Box No. 2241, care of RUBBER WORLD.

RUBBER TECHNOLOGIST DESIRES RESPONSIBLE POSITION. Seventeen years' experience in overall operations. Background includes compounding, research, development, production, cost estimation, management, etc. Address Box No. 2243, care of RUBBER WORLD.

TECHNICAL SALES AND/OR SERVICE TO THE RUBBER AND allied industries. Over sixteen years' experience in development, compounding, manufacturing, as well as technical service and sales. Address Box No. 2244, care of RUBBER WORLD.

The Classified Columns of
RUBBER WORLD
bring prompt results at low cost.

MACHINERY & SUPPLIES FOR SALE

FOR SALE: ALL IN STOCK: 10—Baker-Perkins #17 200-gal. sigma-blade mixers. 5—Pfaudler 500-gallon glass-lined Reactors, 6—465-gal. stainless Reactors, 150# W.P., 165# jkt. 3—4' x 84" vert. Vulcanizers, quick-opening doors, ASME 120#. 1—Farrel 500/1500 HP Horiz. Reducer. PERRY EQUIPMENT CORP., 1424 N. 6th St., Phila. 22, Pa.

SURPLUS EQUIPMENT

4—Blaw Knox 6' x 40' Horizontal Vulcanizers with quick-opening doors, 250# working pressure, ASME.
1—Bolling 3-roll Laboratory Calender, 8" x 16".
2—Royle #½ Extruders, complete.
1—Banbury Midget Mixer with 2 HP gear motor.
1—Farrel-Birmingham 3-roll Lab Calender, 6" x 12".
Address Box No. 2235, care of RUBBER WORLD.

HYDRAULIC PRESSES, 2500-TON DOWNSTROKE 54" x 102". 325-Ton upstroke 28" x 28". 300-Ton upstroke 40" x 30". 300-Ton upstroke 22" x 35". 250-Ton French Oil upstroke 38" x 28". 170-Ton upstroke 24" x 24". 150-Ton Elmes upstroke 36" x 25". 140-Ton 36" x 36" platens. 300-Ton Stokes Transfer Molding Press. New & Used Lab. 6" x 13", 6" x 16", and 8" x 16" Mills and Calenders, & sizes up to 84". Baker-Perkins & Day Heavy-Duty Jack. Mixers up to 200 gals. Hydraulic Pumps & Accumulators, Rotary Cutters. Colton 5½ T, 4T & 3DT Preform Machines motor driven. Other sizes in Single-Punch & Rotary Pre-Form Machines. Banbury Mixers, Crushers, Churns, Tubers, Vulcanizers, Bale Cutters, Gas Boilers, etc. SEND FOR SPECIAL BULLETIN. WE BUY YOUR SURPLUS MACHINERY. STEIN EQUIPMENT COMPANY, 107-8TH STREET, BROOKLYN 15, NEW YORK. STERLING 8-1944.

FOR SALE: 2—20"x22"x60" RUBBER MILLS, 125 HP MOTOR, 1 — 6x12 Lab 2-roll Mill, 3 — 100 & 150-gal. Baker Perkins heavy-duty Mixers 100 HP, 1 — 8" Extruder, 1 — #1 Ball & Jewell Rotary Cutter, Powder Mixers, Tablet Presses, Screens. Your inquiries solicited. BRILL EQUIPMENT COMPANY, 2401 Third Ave., New York 51, N. Y.

MACHINERY & SUPPLIES FOR SALE (Cont'd)

FOR SALE: 1—NATIONAL ERIE 3¼" EXTRUDER, 1—125 HP motor and reduction unit, 3—lab presses 12 x 12 and 15" x 15", 1—Bolling guillotine rubber cutter. CHEMICAL & PROCESS MACHINERY CORP., 52 Ninth Street, Brooklyn 35, N. Y.

MACHINERY AND SUPPLIES WANTED

MOONEY VISCOMETER, MODEL NBS OR STI. STATE auxiliary equipment available and price. Address Box No. 2242, care of RUBBER WORLD.

The Classified Ad Columns of RUBBER WORLD bring prompt results at low cost.

BUSINESS OPPORTUNITIES

Index to Advertisers

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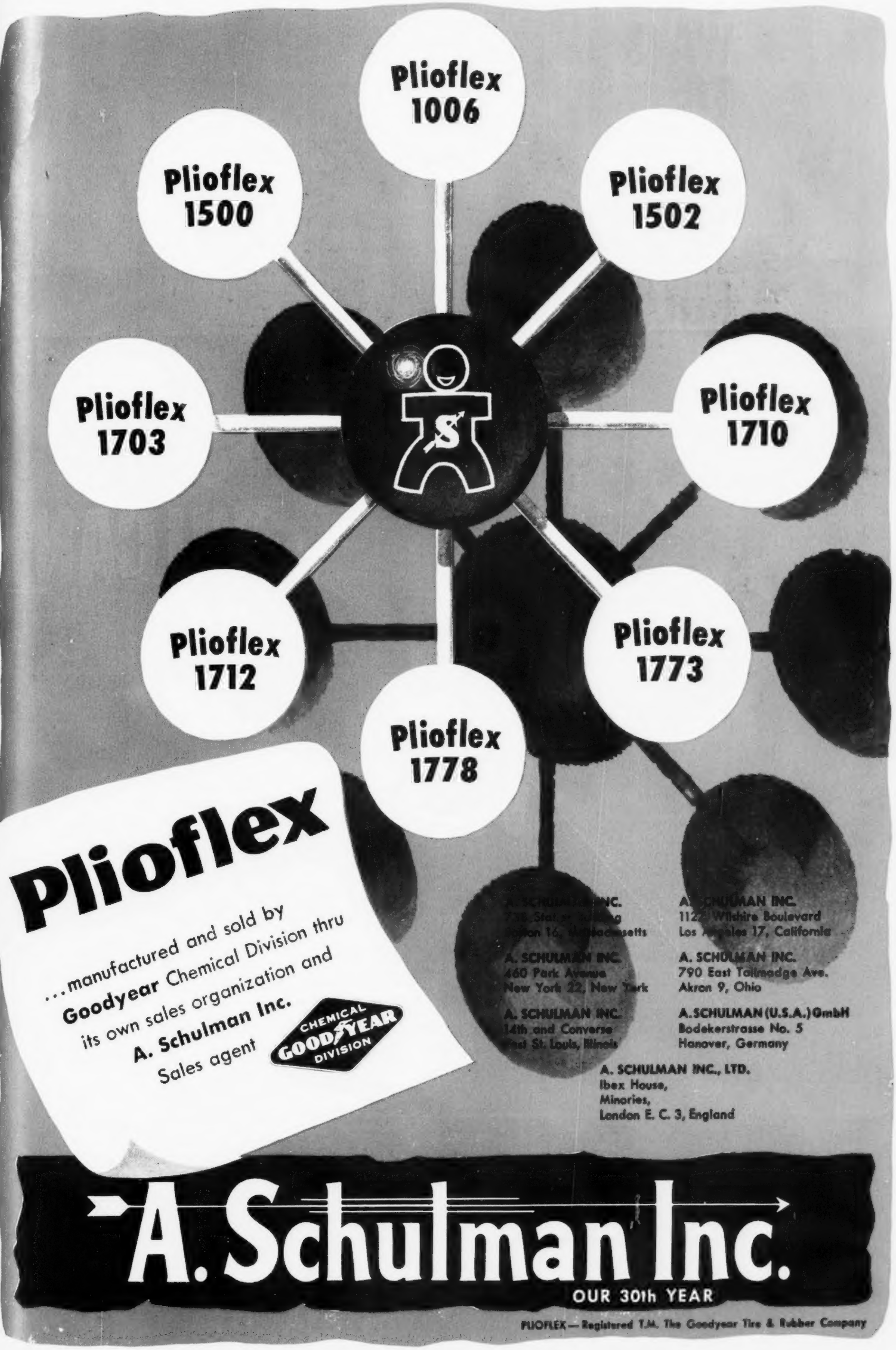

Plioflex 1006
Plioflex 1500
Plioflex 1502
Plioflex 1703
Plioflex 1710
Plioflex 1712
Plioflex 1773
Plioflex 1778
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Goodyear Chemical Division thru
its own sales organization and
A. Schulman Inc.
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OUR 30th YEAR
PLIOFLEX — Registered T.M. The Goodyear Tire & Rubber Company